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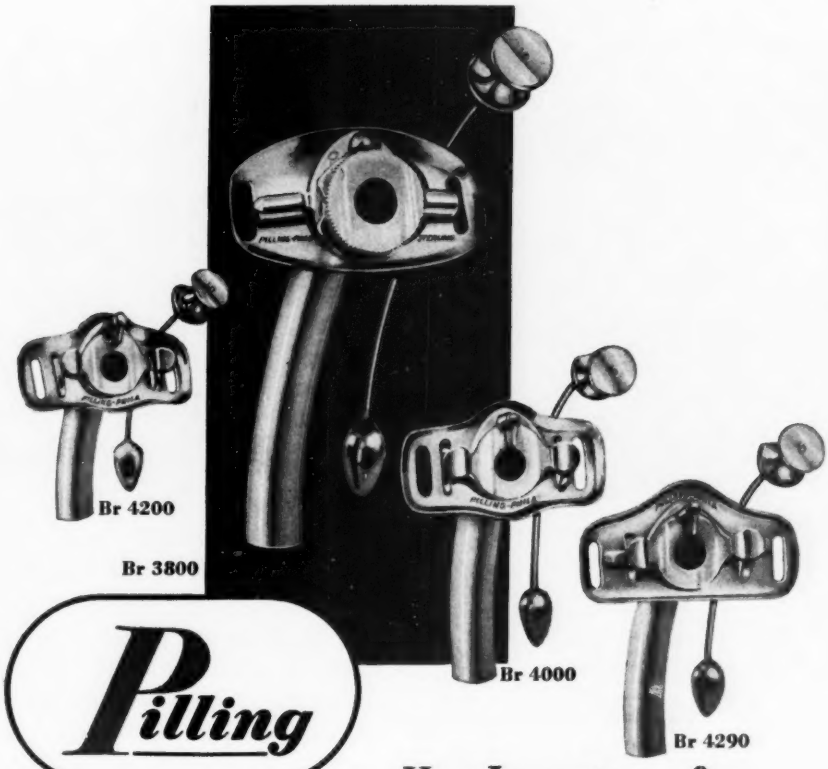

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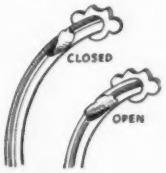

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J. Philadelphia General Hosp. 2:6 (Jan.) 1951.

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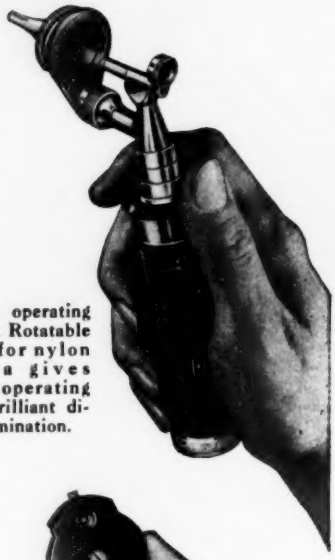

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SYMPOSIUM ON FACIAL PARALYSIS

BELL'S PALSY

ROBERT C. MARTIN, M.D.
SAN FRANCISCO

THE TERM Bell's palsy denotes facial paresis occurring suddenly in an otherwise healthy person. It is not due to trauma. It may be due to virus infection, as in the Ramsey-Hunt syndrome. (Patients with the Ramsey-Hunt syndrome are not considered in this report.) It may also be due to neighborhood focal infection, in which case its onset is more gradual, the treatment obvious, and the differentiation from the ischemic palsy clear.

The ischemic palsy is characterized by sudden onset with or without pain, usually the latter. Frequently, there is an exposure to cold, which is one mechanism of setting up an ischemia. This may explain why the percentage of severe cases with nonrecovery varies so much in different parts of the world. Neurosurgeons here see most of these patients, and they do not see such a high per cent of poor results with conservative treatment as is reported elsewhere. Perhaps we do not get the severe neurocirculatory blocks our more northerly neighbors do.

PROGNOSIS OF RECOVERY

Prognosis of recovery must be based on a careful history that notes the type of onset, physical findings, and special tests.

Onset may be sudden, gradual, and/or accompanied by pain. Presence of pain gives a poorer prognosis.

Physical findings should take into account muscle tone, voluntary control, emotional control (in that order of importance), taste loss, and tearing. Other authors believe that taste loss is an important factor; I do not. Tearing, though worthy of consideration, is a relatively unimportant element.

Regarding special tests—electrical reaction tests—there is wide variance of opinion as to their value.

While loss of Faradic response is considered most important by Tickle,[1] Sullivan,[2] and others, neither Kettel [3] nor I believe it a very reliable indicator. If Faradic response is lost, this occurs 10 to 14 days after onset. Sullivan thinks that an accurate result is difficult to obtain because of skin resistance and therefore suggests exposing and directly stimulating the nerve, in which case it may be found to react even though it did not when tested through the skin.

1. Tickle, T. G.: Surgery of the Seventh Nerve, J. A. M. A. **136**:969-972 (April 10) 1948.
2. Sullivan, J. A., and Smith, J. B.: The Otological Concept of Bell's Palsy and Its Treatment, Tr. Am. Oto. Soc. **38**:233-255, 1950.
3. Kettel, K.: Bell's Palsy: Pathology and Surgery: Report Concerning Fifty Patients Who Were Operated on After the Method of Ballance and Duel, Arch. Otolaryng. **46**:427-472 (Oct.) 1947.

Lathrop [4] noted a lack of Faradic response in patients with traumatic injuries and found that in some of these patients such response could be obtained while the patient was anesthetized. The anesthetic permitted the use of a sufficiently strong current. I have seen patients with operative trauma who showed no Faradic response and yet recovered Perhaps either Sullivan's or Lathrop's [4] explanation may hold good in clearing up the confusion.

Electromyography is only as good as the neurologist who makes the test and interprets it. I have found it of value, while Sullivan,[5] House, and Viole have not. It is an adjunct, but it should not be relied on exclusively any more than any other factor considered.

TYPES OF RECOVERY

Spontaneous.—In spontaneous recovery nothing more than muscle support and possibly Galvanic muscle stimulation have been used. This procedure is said to leave 15 to 25% of the patients with a late return, poor results, or no return.

Medical.—Nonsurgical patients are those who are vigorously and early treated with the vasodilator drugs or autonomic blocking agents. Their recoveries should be termed medical recoveries and will be discussed in detail later.

Surgical.—Surgical treatment of Bell's palsy involves a decompression of the nerve trunk in its vertical portion by converting its bony canal into a trough and then splitting its sheath longitudinally, especially in the region of the stylomastoid foramen. (It is unfortunate that this procedure is usually referred to as a decompression. More properly it should be known as a neurolysis, which it is.)

Procedures.—During the recovery period muscle support must be done by means of various splints, tape, or fascial slings. The appropriate method is determined by the rapidity and completeness of recovery. In a few instances it may be necessary to combine fascial slings with medical and/or surgical therapy if too long a time has elapsed between onset and treatment. Galvanic stimulation may help maintain the activity of the scanty fibers of the facial muscles.

FAILURE OF RECOVERY

The percentage of patients who fail to recover varies considerably but is given as 15 to 25%. It is not so high here but may be elsewhere where the climate is severer.

PATHOLOGY

It is obvious that the condition is a neuritis. If so, what is its cause?

1. It is undoubtedly occasionally due to infection in the teeth, throat, and nose. Any foci about them should be cleaned up. Findlay [6] believes that patients exhibiting these symptoms have a more gradual onset without pain and consequently the best prognosis.

2. The response to vasodilator drugs, with procaine blocking of the cervical sympathetic chain or direct injection of the chain, indicates that a neurocirculatory

4. Lathrop, F. D.: Facial Nerve Surgery in the European Theatre of Operations, Laryngoscope **56**:665-676 (Nov.) 1946.

5. Sullivan.[2]

6. Findlay, J. P.: Personal communications to the author; Operation for Bell's Palsy by Decompression and Incision of the Sheath of Facial Nerve, M. J. Australia **2**:865-866 (Dec. 21) 1946.

disturbance is producing the ischemia. The historical evolution of this fact should be traced. Duel and Ballance [7] noted the edema of the nerve which caused it to bulge from its sheath when neurolysis was done. From these findings Duel and Ballance thought that the edema (cause unknown) further produced an ischemia and damage, and they concluded that the paralysis was due to ischemia of the compressed segment and not to peripheral stasis.

Lewis, Pickering, and Rothschild [8] produced a pure form of ischemia by tourniquet pressure. The paralysis produced by a cuff had a centripetal onset and affected touch before pain and pain before motion. The latency of onset in the upper arm was almost constant (paralysis in 25 minutes) and was the same with pressures of from 150 to 300 mm. of mercury.

When the paralysis had commenced, a second cuff was placed below the first with the same applied pressure. When the first cuff was removed, recovery from the paralysis occurred; the paralysis recurred after the lower cuff had been on for 25 minutes.

Sufficiently intense pressure for two hours produces a more prolonged paralysis of both sensation and muscular power, lasting six to eight weeks before the first signs of recovery. The peripheral portion of the nerve is then observed to be degenerated, and the muscles are atrophic and fibrillating.

Denny-Brown and Brenner [9] repeated the tourniquet experiments and demonstrated that no change was produced when pressures less than systolic were used. When pressures as great as 200 cm. of mercury were applied for two hours the following facts were observed: 1. If the animal were killed the same day, no changes showed in the axis-cylinders or myelin. 2. Histologic changes characteristic of ischemic paralysis appeared within 24 to 48 hours and progressed to about the 10th day. One change was loss of myelin at the nodes of Ranvier. There was also slight edema of the compressed region with a few scattered lymphocytes between the nerve fibers, and great thickening and some vacuolation of the axis-cylinders where they were compressed. There was also some vacuolation of the myelin. This "intermediate degree of paralysis" without true degeneration gave a delayed recovery, but it did occur. Motor recovery occurred in from 2 to 18 days.

Denny-Brown and Brenner [8] further studied the effects of more localized pressure by using metal clips. They believe that an added factor of angulation and unequal stress causes physical injury in addition to the ischemia produced in pure form by tourniquet compression and consequently that Wallerian degeneration of some fibers may be expected.

If continued pressure is severe, "the affected segment is preserved in a state of ischemic necrosis. The neighboring segments, both proximal and distal, degenerate." The latter effect is a result of vascular stasis in the neighboring region.

7. Duel, A. B.: Clinical Experiences in the Surgical Treatment of Facial Palsy by Autoplastic Nerve Grafts: Ballance-Duel Method, Arch. Otolaryng. **16**:767-788 (Dec.) 1932.

8. Lewis, T.; Pickering, G. W., and Rothschild, P.: Centripetal Paralysis Arising out of Arrested Blood Flow to the Limb, Including Notes on a Form of Tingling, Heart **16**:1-32 (Oct.) 1931.

9. Denny-Brown, D.: Paralysis of Nerve Induced by Direct Pressure and by Tourniquet, Arch. Neurol. & Psychiat. **51**:1-26 (Jan.) 1944; Lesion in Peripheral Nerve Resulting from Compression by Spring Clip, Arch. Neurol. & Psychiat. **52**:1-19 (July) 1944.

The edema already noted is secondary, not primary. The foregoing experiments establish the ischemic nature of Bell's palsy.

The vasospastic nature of this condition is emphasized by Hilger's[10] work on the medical aspects of treatment. Kettel[3] believes the neurocirculatory disturbance is the important factor which may not be corrected by decompression and neurolysis, thus explaining the occasional failure of functional return in a correctly performed neurolysis. He noted aseptic, noninflammatory bone changes in the wall of the facial canal in 36% of 50 patients. In 20% there was bony necrosis around the stylomastoid foramen but no signs of round cell infiltration or granulation tissue.

He also noted that some 28 nerves did not bulge when their sheath was slit, while 22 did. The bulging occurred in patients with fresh and with relapsing paresis. This is what one might expect.

Most operators show and comment on the greater "swelling" of the vertical portion than the horizontal, but the normal nerve shows a variation in size in its two portions, as Kettel has noted in dissection, and as I have noted.

Most authorities believe that the region of the stylomastoid foramen is the point of possible greatest pressure and angulation, where circulatory dysfunction and edema could cause the greatest damage. The arterial supply of the nerve helps explain this. The horizontal portion of the nerve has a richer blood supply than the lower part of the vertical portion.

The main arterioles are longitudinal ones from the stylomastoid artery and the superior petrosal branch of the middle meningeal artery, which enters the nerve sheath at the hiatus for the greater superficial petrosal nerve. At the region of the opening for the chorda tympani, the posterior tympanic branch leaves the facial canal and on the drum and medial surface of the middle ear anastomoses with branch arteries from the middle meningeal, ascending pharyngeal, and internal maxillary arteries. It can be seen that ischemia in the lower vertical portion would have less chance of collateral relief than ischemia in the upper vertical and horizontal portions.

TREATMENT

Hilger[10] has proposed a physiologic approach to the pathology by trying to correct the existing vasospasm and resorb transudates.

Procaine hydrochloride is used intravenously; 4 mg. per kilogram of body weight is an initial safe dose. Nicotinic acid in the form of monoethanolamine salt is also used intravenously as a vasodilator and is available in 50 mg. ampoules under the name nicamin.* Treatment should be early and vigorous. Results seem to be promising. Hilger states that on several occasions he has had immediate response to intravenous injections of procaine hydrochloride. This was obtained before the edema had become sufficient to cause further dysregulation of function.

He believes that the primary disturbance is of the vasa nervorum—that surgery corrects the edema but not the vessel disturbance that is the underlying cause. Surgery would reduce the angulation at the point of vasoconstriction which has been shown to cause more edema than that produced by the vasoconstriction. However, it corrects not the underlying vasospasm but its result, edema. Medical therapy would not add surgical trauma to an already damaged nerve.

10. Hilger, J. A.: Discussion of Sullivan and Smith's Paper, Tr. Am. Otol. Soc. **38**:233-255, 1950; Vasomotor Labyrinthine Ischemia, Tr. Am. Otol. Soc. **38**:176-197, 1950; Nature of Bell's Palsy, Laryngoscope **59**:228-234, 1949.

Surgery is advocated by some for the 15 to 25% of the patients who may make no recovery. There are various opinions as to how to select these patients but no general agreement as to any factor permitting a decision. Many patients who might be operated on would recover (if imperfectly). Except for Kettel, no one reports failures in those cases in which operation was done early and precisely; hence it is difficult to find the percentage of surgical failures.

I cannot find any neurosurgeons hereabouts who will concur with Pickerill [11] or Sullivan, who quotes him, that in 25% of cases "the usual line of treatment results in complete failure."

The surgical approach has been of interest since Ballance and Duel first decompressed a facial nerve and obtained recovery. Tumarkin [12] advocated decompression in severe cases of Bell's Palsy. He felt that loss of taste plus pain was the most significant sign of a bad prognosis.

Cawthorne [13] and Sullivan [2] believe Faradic reaction is the most reliable test, whereas Kettel has not found it so. Tumarkin,[12] Findlay, and Sullivan consider sudden onset with pain as one of the decisive factors in deciding for or against early surgery. Their premise is that early relief of the edema before degeneration sets in gives a more perfect recovery of function without associated movements plus a greater assurance that some recovery will ensue. Against this must be balanced the medical therapy of Hilger, directed at the primary cause, plus Kettel's experience and statement that immediate decompression failed to give good results in three of his cases. Kettel's indications for surgery are (1) failure of functional return after two months have elapsed—he states that in no cases has there been spontaneous recovery if it did not occur within this time—(2) stopping of partial return and (3) a patient who has had relapsing paresis.

The foregoing paragraphs show the lack of agreement on any definite signs or symptoms by which we can make a decision for immediate surgery.

CONCLUSIONS

1. A carefully taken medical history as to onset and the signs and symptoms thereof plus the Faradic stimulation test (which I do not believe is reliable) and electromyography (which I believe is only as reliable as the operator doing the test) must all be considered in arriving at any decision which may favor surgery in cases of Bell's palsy.

2. Medical therapy—i. e., intravenous injection of procaine hydrochloride, intravenous injection of nicotinic acid, muscle support, and Galvanic muscle stimulation should be tried first.

3. If after two months there is no return of function or if there is a relapsing paresis, surgery may be done (Kettel).

4. Since no criteria for immediate operation are agreed upon, I believe that more nerves will be saved by medical therapy than by perhaps unnecessary surgery.

384 Post St.

11. Pickerill, H. P., and Pickerill, C. M.: Early Treatment of Bell's Palsy, Brit. M. J. **2**:457-459 (Oct. 6) 1945.

12. Tumarkin, I. A.: Indications for Surgery in Severe Bell's Palsy, Brit. M. J. **1**:580-581 (March 21) 1936.

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MANAGEMENT OF TRAUMATIC LESIONS OF THE FACIAL NERVE

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FACIAL paralysis is not commonly encountered today in the routine practice of otolaryngology. At one time in the history of this specialty, however, it was not uncommon after mastoidectomy, and it stimulated the constructive pioneering of Drobnik,[1] Körte,[2] Bunnell,[3] and Ballance and Duel,[4] on which the treatment of traumatic lesions of the facial nerve is founded. Fortunately, as the training in otolaryngology became better, the incidence of facial paralysis following mastoidectomy decreased and, with the advent of the sulfonamides and antibiotics, it was reduced to a relatively rare occurrence by the marked reduction in mastoid surgery.

Nevertheless, injuries to the facial nerve still occur. Although facial palsy following surgical intervention on the mastoid process has largely been eliminated, its incidence due to other causes has increased. Some of these are the result of progress in our civilization. Trauma to the facial nerve following surgical procedures for the extirpation of neoplasms of the brain, parotid gland, or face and automobile accidents resulting in severe lacerations of the face or fracture of the skull are more prevalent today than they were a generation ago. Furthermore, as long as man wields a knife or uses a gun in combat, facial paralysis will be with us. It has definitely increased as a result of the nature of modern warfare.

The management of facial paralysis secondary to traumatic lesions of the facial nerve requires considerable surgical dexterity and judgment, which can best be obtained through relatively frequent personal encounters with problems of this nature. Regardless of the etiologic nature of the facial paralysis, if the palsy is complete, the patient should gain assurance from the surgeon's initial examination that all is not lost and that something can be done which will lessen the diabolical asymmetry of the face.

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3. Bunnell, S.: Suture of Facial Nerve Within Temporal Bone, with Report of First Successful Case, Surg., Gynec. & Obst. **45**:7-12 (July) 1927.

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When the paralysis is unilateral, the patient's psychologic adjustment to his facial deformity is, at best, difficult. Therefore, every effort should be made by the examiner to assess carefully the injury to the facial nerve not only to facilitate arrival at an opinion as to the appropriate corrective measure to be employed but also to aid the patient in his psychologic rehabilitation by explaining just what can be accomplished to improve the deformity. I have found postoperative photographs or personal interviews with patients who have had similar defects corrected most helpful in accomplishing this rehabilitation. The majority of patients whose facial palsy has been alleviated are impressed by an opportunity to exhibit to their less fortunate brethren just what can be accomplished by treatment. Furthermore, such interviews, through an exchange of ideas relative to a mutual experience, materially aid the patient in making readjustments that must occur if he is to obtain satisfactory relief of the facial paralysis.

An adequate history is of utmost importance in arriving at an opinion as to the best way to manage an individual case of facial paralysis. It is not sufficient merely to know that the palsy followed mastoidectomy, intracranial operation, head trauma, or some similar occurrence, since information relative to the time the facial paralysis occurred, whether immediately or several hours or days after the injury, is of greater importance. A strenuous effort should be made in every case to ascertain this point, since such knowledge will determine whether early surgical intervention is indicated. There is no excuse for the surgeon who operates in the vicinity of the facial nerve not to know whether the palsy that followed operation was immediate or delayed. In most cases it is a simple matter to determine in the unconscious patient whether the facial nerve is physiologically intact by obstructing or irritating the trachea so that the accessory muscles of respiration are brought into action. If both nasal alae move, then the surgeon can rest assured that the facial nerve is physiologically intact at the moment, whereas if the ala on the side operated on fails to move while that on the other side does, the nerve is at least physiologically interrupted. When neither moves because the patient is so deeply anesthetized that this reflex will not occur, it is the responsibility of the operator to check the patient's facial reaction to painful stimuli or voluntary facial movements as soon as he has responded sufficiently to permit such tests.

The history also should establish the duration of the facial paralysis and, when it followed operation, the nature of the surgical procedure performed. The surgeon's explanation for the injury to the facial nerve may be enlightening. Although information of this nature is not as definitive in crystallizing the management of such cases as is that relative to the onset of the palsy, it does materially aid in formulating a program of treatment.

Animal experimentation on nerve regeneration has demonstrated that the Schwann tubes of the peripheral nerve stump are reduced in size if they are left uninnervated and that this affects functional restoration of the nerve. In addition, a denervated muscle exhibits disuse atrophy which increases with the duration of the paralysis. Theoretically, then, a patient with complete peripheral facial paralysis that has existed for several years has less opportunity for satisfactory functional recovery, even though the defect in the nerve be eradicated, than if it has been present for only a few months. This has been confirmed by clinical experience. If

complete peripheral facial paralysis has been present for much longer than a year, little if anything worth while is to be gained by restoration of the anatomical continuity of the facial nerve.

Roentgenograms of the skull or mastoid, electrical reactions, and tests for taste or tearing are, in the majority of instances, of little help in either localizing the injury to the nerve or managing the paralysis. Roentgenologic studies often are difficult to evaluate in determining the location of the lesion incurred by the facial nerve because of failure of the bone fragments to be displaced in the presence of an existing fracture or the inability to determine which fracture is producing injury to the nerve. A positive electrical reaction obtained with Faradic current or by electromyography suggests that the prognosis for spontaneous recovery is good, while a negative reaction merely indicates that the facial nerve is interrupted but does not distinguish between physiologic and anatomic discontinuity of the nerve. Galvanic electric tests do not give any information with respect to the facial nerve but do permit evaluation of the ability of the paralyzed facial muscles to contract. Satisfactory contraction of the muscles when stimulated by a Galvanic current indicates that voluntary movements of the face should be obtained if the anatomic and physiologic continuity of the facial nerve can be restored. A negative response signifies that any attempt to reinnervate these muscles will result in failure. The meager information that may be obtained from tests for taste and tearing is so unreliable and contributes so little to the management of facial paralysis that I no longer utilize them.

On occasion, the results of these special laboratory studies, when integrated with other data, are definitive in arriving at a decision with respect to the treatment in a particular case. In such instances, their value cannot be overestimated. However, it would be wise for those who are interested in the treatment of facial paralysis to review the roentgenograms and to observe or perform the electrical tests in every case in order that such tests might be interpreted with the history and clinical examination in mind. A fracture line that had been overlooked by the roentgenologist might be noted because the clinician had observed suggestive evidence of such a fracture when he examined the external auditory canal. I am sure that more than one positive Faradic reaction has been reported when none existed because a positive reaction was obtained from the masseter muscle. Electromyography, in my experience, has not been infallible. In one patient in whom the facial palsy had been present for approximately a year, the electromyographic report indicated that the facial nerve was physiologically intact in spite of the fact that the patient's face was still paralyzed. On exploration of the facial nerve, it was found that the defect in the facial nerve was bridged by a few gossamer-like threads of nerve tissue. These fibers apparently were sufficient to permit a positive electromyographic result but were insufficient to attain functional recovery from the paralysis.

Much can be learned through observation and manipulation of the palsied side of the face during the course of the clinical examination which will be helpful in arriving at a prognosis of recovery from the facial paralysis. The more anterior the injury with respect to the anterior border of the parotid gland, the more difficult it becomes to effect a repair because of the progressive attenuation of the branches of the facial nerve. Injuries to the nerve secondary to an incised wound, without loss or displacement of tissue, are repaired more easily than those secondary to deep or jagged lacerations, regardless of the location on the face. When the para-

lyzed side of the face sags far below the normal side, the eye appears hollow and ectropic owing to atrophy of the orbicularis oculi, and the skin of the palsied side is lax and cooler to the back of the examiner's hand than is the opposite side, it is likely that the paralysis of the face has existed for a considerable period and the injury to the facial nerve has been severe. The prognosis in such cases usually is poor. On the other hand, when the facial asymmetry is slight in repose, even though the paralysis is complete, when atrophy about the eye is absent and the muscle tone and skin temperature of the affected side approximate the normal, it may be anticipated that satisfactory relief from the palsy can be obtained from appropriate treatment.

Patients with facial paralysis of a few weeks' or months' duration often will volunteer information during the course of the examination to the effect that the paralyzed side of the face feels less numb and appears to be tightening up and that drooling from the corner of the mouth, collecting of food in the cheek when eating, and tearing from the eye are noted less than at the onset of the paralysis. Testimony of this nature suggests that the prognosis for spontaneous recovery is good and that a period of observation is indicated. If further improvement does not occur within two or three months, the patient should be advised that surgical intervention is necessary.

Integration of pertinent information obtained from the history, clinical examination, and such roentgenologic and electrodiagnostic studies as are considered necessary permits assessment of the facial paralysis and the injury sustained by the facial nerve. Not until then can a plan of management be formulated which will afford the patient the greatest opportunity for relief of his facial paralysis. Cognizance of what can be accomplished to relieve facial paralysis, experience, and surgical dexterity will influence the surgeon's choice of treatment. Only one of three choices can be made initially: Treatment should not be instituted because it is believed that further improvement of the facial paralysis cannot be obtained; the facial paralysis should be observed for a time because the available data indicate that spontaneous recovery may occur, or surgery in some form should be employed to benefit the facial paralysis.

SURGICAL TREATMENT

In my opinion, there is only one indication for surgical attack on the facial nerve when the facial paralysis has been adequately assessed. In every case in which the available data indicate that improvement of the facial paralysis might be obtained from appropriate treatment the facial nerve should be explored unless the facial paralysis followed trauma to the head without evidence of fracture or of surgical procedures in which the facial nerve is known to be anatomically intact at completion of the operation and temporary facial palsy is not uncommonly expected.

The ultimate goal of surgical procedures on the facial nerve is the physiologic restoration of its function. Operations such as decompression, end-to-end suture, nerve grafting, or anastomosis of the distal stump of the facial nerve to the central end of an adjacent cranial nerve effect this result in the majority of cases. Decompression of the facial nerve is readily achieved after either a simple, modified radical mastoidectomy or a classical radical mastoidectomy, as may be indicated by the pathologic process present. Facial paralysis secondary to compression by displaced fragments of bone, foreign bodies, or edema may be relieved in this manner.

When exploration reveals that the facial nerve has been divided or so badly traumatized as to require excision of the injured segment, the anatomical continuity of the nerve must be restored whenever possible by end-to-end suture or nerve graft. When there has been but little loss of substance, the junction may be obtained by mobilizing the distal segment in the neck and parotid gland from the surrounding soft tissue and the exertion of posterior traction in order to gain about 6 mm. Greater losses may be overcome by rerouting the nerve, should the pathologic process permit a radical mastoidectomy. Bunnell [5] stated that gaps up to 23 mm. in extent may be closed in this manner. If the divided ends cannot be approximated by either of these methods, then recourse must be taken to nerve grafting in order to close the defect. For this purpose, it is convenient to utilize the anterior femoral cutaneous nerves or the great auricular nerve from the cervical plexus as the donor. I prefer the latter, for its use does not necessitate additional draping of the patient and its diameter and consistency more closely approximate those of the facial nerve.

When facial paralysis follows an operation or skull fracture, it may be impossible to restore the anatomical continuity because the proximal or distal stumps of the facial nerve are not accessible. This is most likely to occur after the intracranial removal of an acoustic neuroma, excision of a neoplasm arising in and involving the middle ear or facial nerve, and removal of malignant lesions of the parotid gland or face. In such circumstances, the paralysis of the face must be alleviated by other measures. When the central end of the facial nerve is inaccessible, anastomosis of the distal stump of the facial nerve to the central end of an adjacent motor nerve is necessary. For this purpose, the spinal accessory or hypoglossal nerves are admirably suited. Although opinions pro and con exist as to which nerve should be utilized for this surgical procedure, my experience has been that a better result is obtained when the hypoglossal nerve is used.

On rare occasions, none of these procedures are applicable and improvement in the unsightly deformity of the face can be obtained only by plastic surgery. This may consist in either the transplantation of pedicled strips of adjacent muscle innervated by the fifth cranial nerve or mechanical support of the paralyzed side of the face. I have not had experience with the former. Stainless steel or tantalum wire and mesh, animal tendon, and autogenous fascia lata have been utilized to support the face mechanically. When the support is to be permanent, none gives as good a result as do slings of fascia lata. When strips of fascia lata are inserted in the form of slings as described by Brown,[6] Lamont,[7] and others, the cosmetic result in repose is good and slight movement of the paralyzed side of the face may be obtained. If tearing of the affected eye is annoying or inflammation of the eye is a complication of the palsy, lateral tarsorrhaphy will be helpful in controlling these conditions.

It is not my purpose to review the technics involved in the performance of these operative procedures, for this information can best be obtained by reference to the

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6. Brown, J. B.: Utilization of Temporal Muscle and Fascia in Facial Paralysis, Ann. Surg. **109**:1016-1023 (June) 1939.

7. Lamont, E. S.: Plastic Surgery in Facial Paralysis with Modifications in Technic, Arch. Otolaryng. **39**:155-163 (Feb.) 1944.

original papers of Bunnell, Ballance and Duel, and Brown. It should be emphasized, however, that the surgical procedures mentioned which restore both the anatomical and the physiologic continuity of the facial nerve are as applicable to traumatic lesions of the facial nerve located in the soft tissue of the neck, parotid gland, and face as they are to injuries of the facial nerve within the temporal bone for which they originally were designed.

For some reason, it is the general impression that when a defect of the facial nerve exists within the parotid gland or face that cannot be eliminated by end-to-end suture, nothing further can be done to restore the continuity of the nerve. This is not true. Nerve grafts will restore the function of the facial nerve in such situations as well as nerve grafts located within the confines of the temporal bone. Duel,[8] Seeley,[9] Cardwell,[10] and Maxwell [11] have reported cases in which nerve grafting has been employed to repair defects of the branches of the facial nerve. In this connection, it would be well for surgeons who operate on the parotid gland to be aware that should it be found necessary to sacrifice a portion or all of the branches in this area, the facial nerve can be repaired by nerve grafting.

The improvement in the paralysis of the face which will be obtained varies with the accuracy of the assessment of the facial paralysis and the surgical procedure employed and among patients in whom identical measures have been used. For this reason, the surgeon should not be too optimistic in his description of what can be accomplished by treatment, for what will be satisfactory to one patient may not be to another. In general, best results are obtained with those operations which permit restoration of the anatomical and physiologic continuity of the facial nerve. Thus, whenever possible, decompression, end-to-end suture, and nerve grafting should be employed to obtain improvement in facial palsy. Although the results of such procedures are not perfect in that varying degrees of mass motion obtain and fine emotional responses are not restored, they do serve to lift the burden of the grotesque half mask which the patient suffering from paralysis of the face must bear and they accomplish this better than any other form of treatment at our command.

Once return of voluntary movement begins, the patient should be informed of the necessity for assiduous practice before a mirror. He is instructed to make every effort to create a new emotional pattern through exaggerating the movements of the formerly paralyzed side while at the same time depressing the emotional response of the opposite side. For this purpose, mention of the difficulty which patients encountered in learning to wink or whistle voluntarily emphasizes the importance of practice before a mirror more than any description I could give.

Hypoglossofacial anastomosis relieves the asymmetry in repose, but the emotional and voluntary response of the affected side of the face is usually inferior to that following decompression, end-to-end suture or nerve grafting. On occasion, the ability to move this side of the face voluntarily is equal to that following the

8. Duel, A. B.: Advanced Methods in Surgical Treatment of Facial Paralysis (Mütter Lecture), Ann. Otol. Rhin. & Laryng. **43**:76-88 (March) 1934.

9. Seeley, R. C.: Maxillofacial Injuries; Reconstructive Surgery of Dehiscent Parotid Duct and Dehiscent Peripheral Facial Nerve, Am. J. Surg. **73**:551-563 (May) 1947.

10. Cardwell, E. P.: Direct Implantation of Free Nerve Grafts Between Facial Musculature and Facial Trunk; First Case to Be Reported, Arch. Otolaryng. **27**:469-471 (April) 1938.

11. Maxwell, J. H.: Extra-Temporal Repair of Facial Nerve, Tr. Am. Otol. Soc., to be published.

former procedures, but the emotional response rarely is as satisfactory. A sequela of this operation, to which patients rarely object, is the involuntary movement of the formerly paralyzed side of the face on chewing, swallowing, and speaking.

SUMMARY

In conclusion, it should be emphasized that experience with more than 200 patients with traumatic lesions of the facial nerve has demonstrated that much can be done through proper management. Prerequisites for the successful management of these patients, in addition to an awareness of what can be accomplished and the experience necessary for adequate assessment of the facial paralysis, are a thorough knowledge of the surgical anatomy of the facial nerve, a high degree of surgical dexterity and ingenuity, and a great amount of perseverance.

SUMMATION OF PAPERS ON MANAGEMENT OF FACIAL PARALYSIS

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FOR EARLY treatment of Bell's palsy I feel, after reviewing many articles on the subject, that we do not have a conception of the real cause of the condition. These articles shoot close and all around the bull's eye but fail to hit it. They go as far as ischemia but miss the why of the ischemia.

The facial nerve is unique in that it is enclosed from the geniculate ganglion to the stylomastoid foramen in a close-fitting tunnel. Therefore, any traumatism, such as exposure to heat or to cold, causes the nerve to swell. The swelling is not due to infection, as Bell's palsy from otitis media is rare and microscopically necrosis instead of inflammation is found. The swelling of the nerve in the closed tunnel squeezes out its own blood supply, thus resulting first in ischemia, then necrosis, and finally fibrosis.

Similar situations are present in the contused brain enclosed in the unyielding dura mater or in the contents of the closed fascial space in the volar aspect of the forearm undergoing venous congestion and swelling, resulting in Volkmann's ischemic contracture. Some other examples are swelling of the hand in a plaster cast or swelling of a tendon in the annular ligaments in the finger. The sequence is the same: trauma, swelling, ischemia, necrosis, and fibrosis.

Therefore, the only possible time for prophylaxis or prevention of Bell's palsy is during the first few hours—three, if the blockage of circulation is complete, but a few more if partial. Prompt decompression will keep the nerve alive. If decompression is not done then, the ischemia will result in a degree of damage to the nerve ranging from temporary palsy to permanent paralysis.

Prompt surgical decompression will be unnecessary in 80% of the cases. We should decompress in the other 20%, or worse cases, at once, not in three or more days, for by then the irreversible damage has been done.

Our problem therefore is how to recognize the 20% or worse cases. The guides as stated are sudden onset with pain, lessened tears, absence of taste, early atrophy, loss of tone, sag, and absence of regeneration after two months. Electrodiagnosis and electromyography are useless as emergency guides because stimulation through the nerve stops only after 3 to 4 days; reaction of degeneration in the muscles occurs in 4 to 7 days, being definite in 15 days, and Wallerian degeneration is not complete until a month. Loss of muscle response to Faradic current is a good guide, but this does not occur until after 7 to 15 days, which is well after the stage of necrosis. Meanwhile, the prophylactic value of decompression, which is a matter of hours, not days, has been lost. Electromyography is of value but not until after 21 days. This leaves us with no solution to the problem of recognizing and actually preventing the 20% of cases in which palsy will inevitably

develop. Probably it is best to decompress on loss of Faradic response through nerve and when other signs indicate that the case is severe, but this is too late to prevent necrosis of the nerve.

In late cases decompression has been of value, but results vary according to the amount of damage in the nerve. Kettle and others report many instances of bulging of the nerve on decompression within the first two months, but fewer after that.

Nerve damage is to all degrees. Some nerves recover soon, others late, and others partially; but in about 10% of the cases in which complete necrosis has occurred there is no recovery at all. If necrosis has occurred even in a short segment, Wallerian degeneration occurs distally and recovery takes places in the same time as it does after the nerve is sutured. If necrosis is present over a long segment of the nerve, as when there is loss of taste, recovery may not occur. The more necrosis, the more can block movements be expected on recovery. Decompression will help any nerve that has been constricted by scar, but in late cases, by aiding blood supply as Dr. Martin has pointed out, it is largely neurolysis (i. e., freeing the nerve and splitting the sheath to allow the fibrous-bound nerve to expand) that helps. The results thus depend on the amount of damage of the nerve and therefore differ. After Bell's palsy, if the nerve appears on exposure to be in good condition, decompression and neurolysis should suffice; but if it appears reduced to a fibrous cord, then this segment should be excised and the nerve sutured after rerouting, or else substituted for by a nerve graft.

Signs of partial nerve damage or recovery are practically the same. It is best in evaluating to use all tests and signs. Tone of the muscle, symmetry, holding position after placing, resistance on pulling, warmer feeling, less squirting from the angle of the mouth, less tearing, and less food catching in the cheek are the determiners of partial injury or recovery.

Under electric stimulation, the degree of response of the reaction of degeneration is lessened. Improvement in the strength-duration curve, chronaxia tetanus ratio, and the rheobase ratio, and improvement as shown by the electromyogram are indicative. The electromyograph has come to stay. Its results are 90% reliable, and it shows return one or several months before detection by visual observation, but, as Dr. Martin stated, the reliability depends on the care, patience, and interpretation of the operator. Electrical tests are useful to determine the state of the nerve, the prognosis, and whether or not the muscles will react if the nerve is repaired. Electrical examination will show whether or not it is too late to operate on the nerve.

Dr. Lathrop has given us an admirable paper. I agree with all of his points; however, I think that considerable may be gained by the advances in electrodiagnosis and electromyography. I wish that he had told us of his results from nerve repair after gunshot wounds, for he has had the greatest experience of us all in this line.

As to the operation, decompression is a simple procedure, uncovering the nerve at the stylomastoid foramen and following upward. I do not agree with former papers that state that the nerve should be sutured when infection is present, for the degree of regeneration is in direct proportion to the accuracy of the nerve union. I believe that rerouting where possible is better than nerve grafting and

that direct suture is needed unless nerves can be merely laid accurately together in a channel. For grafts I prefer the sural nerve, but the great auricular or a branch of the anterior crural will do.

It is beneficial postoperatively to keep the muscles active by galvanic stimulation and to keep them relaxed by placing a hook in the angle of the mouth and attaching it by an elastic band around the ear.

Failing repair of the nerve, plastic repair is advisable, not by merely hanging the face up by slings of fascia but by using half of each of the temporal and masseter muscles with their blood and nerve supply, detaching their insertions, and prolonging them with multiple fascial slings inserted into the movable parts of the face on the far side of both eye and mouth. This gives action to the paralyzed face.

My own experience with facial nerve palsy consisted of 41 operations—8 within the temporal bone, 12 extratemporally, 14 of preserving every branch of the facial nerve during total removal of the parotid gland, and 7 of plastic repairs to the face. I found that the facial nerve could be repaired successfully as deep as the internal meatus and as far distally as a vertical line ½ in. (1 cm.) behind the eyes. Even wide gaps of the peripheral branches in the face were successfully bridged by multiple grafts from the sural nerve.

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SOME VIEWPOINTS ON THE OPERATIVE TREATMENT IN MÉNIÈRE'S DISEASE

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MÉNIÈRE'S disease has presented a difficult and baffling problem to our research colleagues. Attempts have been made to explain the etiology and pathology in order to arrive at a unitary conception of the disease. Probably the term Ménière's syndrome would be more appropriate than Ménière's disease. The experimental therapeutic variations are countless. Especially is this true of the conservative treatment, although many different forms of operative treatment also have been attempted.

As the etiology and pathology are not sufficiently well known, and fundamental concepts are certainly often widely divergent, it is obvious that a single therapeutic principle could not be adequate. In the majority of the cases, one is able to remove or allay the symptoms for a longer or shorter period, but a completely ideal method of treatment has not been found.

Most authors agree that the symptoms are probably caused by an increase in pressure in the labyrinth. Etiologic factors might be allergy, disturbances in histamine conversion, hypovitaminosis C, vasospasm, etc., accompanied by increased capillary permeability. Through postmortem investigations, Hallpike, Cairns, Lindsay, Berggren, and others have demonstrated pressure increases in the labyrinth.

The conservative treatment methods will not be further discussed except so far as they are important as preliminary or supplementary aids to the surgical treatment. My intention is to offer an addition to and a modification of the operative procedure.

Dandy's operation and similar operations on the vestibular nerve result in freedom from vertigo in many cases, but the operation has its disadvantages. It is a serious intracranial operation which is never without the risk of complications. The probability of exactly dividing the eighth nerve is far from 100%, and the roaring sound, which is often the patient's greatest complaint, is unaffected. There are many reasons, therefore, for attempting to achieve the result by operative procedures in the labyrinth. This means either relief of the intralabyrinthine pressure or destruction of the vestibular apparatus. In the majority of cases in which the desired effect has been achieved, the acoustic function has also been severely damaged.

Alcohol injection into the labyrinth according to the method of Mollison was for a relatively long time considered to be the superior procedure, but it has been almost entirely abandoned now, perhaps mainly because of the not infrequent occurrence of complicating facial paralysis.

The very slight difference, so far as principle is concerned, between the treatment of Ménière's disease introduced by Mollison in 1935 and our present treatment

is remarkable. Mollison states: First try every possible conservative treatment in the form of sedatives and other medicinal preparations, low-fluid diet, etc. If results are negative, surgical treatment is advised: either (1) conservative, which is intended to effect a reduction of the intralabyrinthine pressure, by (*a*) decompression of the labyrinth through fenestration without injuring the membranous canal, (*b*) lumbar puncture, (*c*) puncture of the cerebellopontine cistern, (*d*) opening of the saccus endolymphaticus according to Portmann's method or (*e*) occipital decompression according to the method of Aboulker; or (2) radical surgical treatment, sacrificing the function of the inner ear through (*a*) destruction of the inner ear, or (*b*) cutting the vestibular nerve. New aids and widened experiences have made possible many variations, but for the most part this outline is still effective today.

Later modifications of labyrinthine destruction are too well known to need recapitulation. Lempert considers it necessary to destroy the acoustic apparatus in such a manner that the degeneration of the entire labyrinth may be depended upon. He points out that the hearing in the affected ear is so poor, as a rule, that it is worthless anyway.

Day's operation with diathermic coagulation of the labyrinth would seem to result in complete destruction of the vestibular as well as the cochlear function in all cases, but such is evidently not the case. In 3 out of 21 cases the hearing was usable after the operation. In his postmortem examination in collaboration with Lindsay, Day found that the organ of Corti and the tectorial membrane, as well, were partially destroyed, it is true, but, nevertheless, the patient had had usable hearing immediately before death. However, even if there are exceptions, the hearing, as a rule, is lost. This operation has been abandoned more and more, owing to the risk of damage of the facial nerve.

Cawthorne's operation for Ménière's disease appears to be the most popular today. Cawthorne himself admits that if the operation is correctly carried out the hearing is destroyed in all cases, as he also shows in his recently published large collected series. He points out that the operation is relatively mild and easily performed. The patient is ambulant after one week and may leave the hospital after three weeks. Vertigo, as a rule, completely disappears, and the patients are pleased that they are enabled to return to work. No detailed information about postoperative tinnitus is given.

Among the criticisms concerning the aforementioned and other operative methods, it is unanimously pointed out that the symptom of vertigo is often made to disappear, but, on the other hand, tinnitus usually remains unchanged and the hearing is partially or completely destroyed.

The ideal for a successful Ménière operation, in my opinion, should be a nondangerous procedure that will bring about alleviation of the troublesome symptoms, vertigo and tinnitus, or at least their reduction to such a degree that they do not disturb the patient, and the simultaneous preservation of the hearing. Sometimes the hearing is worthless and may then be sacrificed. In many cases, however, the Ménière symptoms may be severe and troublesome for the patient although the hearing is relatively good constantly or remittently. In these cases it is unquestionably desirable not to be obliged to follow a therapeutic procedure which is catas-

trophic for the hearing. In cases of bilateral involvement, operative treatment may be considered if the hearing can be preserved, but, on the other hand, surgery is inconceivable if in all probability the hearing will be destroyed.

Lindsay, who thoroughly studied different operative methods and made logical observations, appears to have become more and more pessimistic concerning the aforementioned objectives. He considers that disagreeable tinnitus and diplacusis, which presumably have their origin in the same cause as the loss of hearing, cannot be surgically improved without destruction of the auditory function. He also thinks that this form of auditory damage cannot be benefited through surgical therapy. It was not until after I had performed the operation which I am about to report in a number of cases that Lindsay published two statements which are very significant to me and which agree with the idea which was the basis for a part of my procedure:

1. Obstruction of the semicircular canal some millimeters distal to the ampulla in monkeys does not produce histologic changes in the auditory apparatus in most cases.

2. The histologic findings in experiments on monkeys, as well as experience with the coagulation operation on the semicircular canal in humans, indicate the necessity of a search for an operative method which abolishes the vestibular function without destroying the acoustic.

Reduction of the intralabyrinthine pressure should consequently be only one part of a Ménière operation. As the tinnitus, which is not infrequently just as annoying as vertigo, is improved by this operation in only a part of the cases, it seems that every procedure which might logically be considered as being effective against tinnitus is also justified. To these belongs Lempert's tympanosympathectomy.

My own conception of the role of the tympanic plexus and tympanosympathectomy in this regard is presented in my article, "Observations on Anatomy of the Tympanic Plexus and the Technique of Tympanosympathectomy" in a preceding number of the A. M. A. ARCHIVES OF OTOLARYNGOLOGY.[1] The necessity was stressed therein of careful observation of the anatomy of the tympanic plexus in each individual case and of scrupulous removal of the entire plexus with all suspected anastomoses if the drawing of any conclusions concerning the efficacy of the operation is to be possible. I have adopted Lempert's idea as a working hypothesis and performed tympanosympathectomy in a large number of cases, including cases of Ménière's disease. In all cases the operation was carried out in the aforementioned radical manner in order that no anastomoses might conceivably remain, provided none occurred outside the region of the medial wall of the middle ear.

One further detail appears to be of possible importance in the occurrence of tinnitus. During a strong muscle contraction, as for example in cases of trismus, or with voluntary induced contraction of the chewing muscles, a roaring or a buzzing noise of varying intensity is not infrequently produced. It does not seem improbable that a similar sound and an even more pronounced discomfort could arise through a tonic contraction of the tensor tympani or the stapedius muscles provoked by different pathologic conditions in or about the ear.

If one accepts the possibility of two sound systems, as Samuel Rosen suggested, even the chorda tympani nerve should be important, supplying the sense of sound through the intermedius nerve. Accepting this and the possibilities mentioned above,

1. Frenckner, P.: Observations on Anatomy of the Tympanic Plexus and Technique of Tympanosympathectomy, A. M. A. Arch. Otol. **54**:347-355 (Oct.) 1951.

I have performed chordectomy simultaneously with tympanosympathectomy and have also cut the tensor tympani tendon in all cases, and have cut the stapedius muscle tendon in those cases in which the stapes has been immobilized, i. e., in otosclerosis.

The operation which I performed in cases of Ménière's disease in accordance with the principles presented consists of the following parts:

1. Relieving of the intralabyrinthine pressure through the fenestration operation.

2. Destruction of the greater part of the vestibular function without causing injury to the membranous labyrinth with the risk of degenerative alterations in the vestibular and cochlear system. This is achieved through tamponade of the

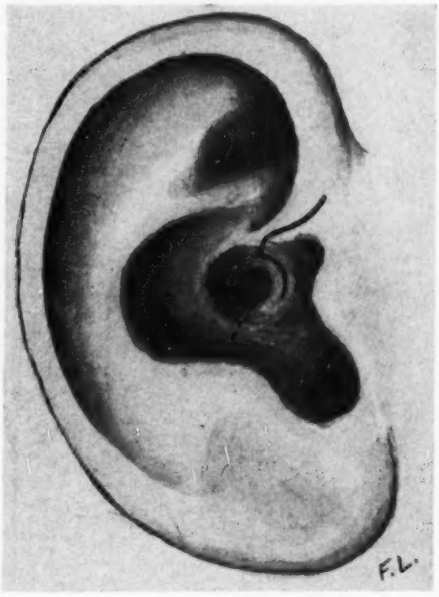

Fig. 1.—Incision in the meatus.

vestibule and the ampullar portion of the horizontal semicircular canal. In earlier labyrinthine Ménière operations, the vestibular portion of the membranous labyrinth was intentionally damaged or removed. The result was deafness, almost without exception, without direct injury to the cochlea. The cause was probably the depositing of fibrin or a similar substance in the cochlea, resulting from the destruction of the endothelium of the semicircular canal within a certain area. It is my hope that such disruption of the cochlear function will not arise as a secondary effect if the membranous labyrinth is only tamponaded and blocked without injury.

3. Careful protection of such auditory function as exists.

4. Attempts to influence tinnitus through (*a*) tympanosympathectomy; (*b*) cutting the chorda tympani nerve; (*c*) cutting the tensor tympani muscle tendon, and (*d*) cutting the stapedius muscle tendon.

OPERATIVE PROCEDURE

Following are the principal features of the technique.

In order to make the entire operating field, including the promontorium, easily accessible and still obtain a good and completely covering flap, the flap should be made considerably larger than usual and with more extensive detachment of the membranous wall of the external auditory canal than is usually indicated. The incision in the auditory canal for this purpose is carried out in the following manner:

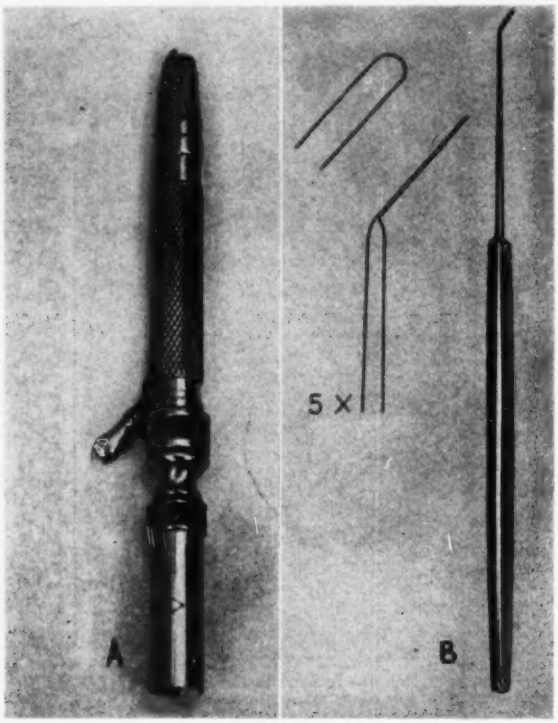

Fig. 2.—*A*, handpiece with tube for water irrigation; *B*, silver spatula.

1. Across the anterior wall of the auditory canal, corresponding to the outer edge of the os tympanicum, a first curved incision is made and this is continued outward in the anterior part of the roof of the auditory canal 1 to 2 cm. upward along the anterior margin of the concha.

2. A second incision is made across the posterior wall of the auditory canal, originating at the inner upper angle of the first incision and continuing and laterally along the bottom of the auditory canal to its orifice. By means of the second incision, a small flap attached to the concha is created; this flap will cover the posterior portion of the auditory canal after the termination of the operation and prevent stricture formation.

3. Separation, as usual, of the entire posterior extension of the auditory canal as far in as the annular ring is made with a longitudinal incision parallel to the length of the auditory canal up to a point corresponding to 1 o'clock in the right ear and to 11 o'clock in the left, as well as in the anterior portion of the floor of the auditory canal to a point corresponding to 5 o'clock in the right ear and to 7 o'clock in the left.

The upper incision should be made as far in as the annular ring in order to prevent tension and wrinkling when the flap is placed in the attic. The lower incision should originate some millimeters lateral to the annulus to allow the large flap a broad base. The annular ring must be detached in that whole area which is specified as the base of the flap, in order to facilitate a forward displacement of the drum membrane and the flap and thereby permit good exposure of the promontorium.

4. The outer edge of the os tympanicum is exposed and removed to permit a better direct view of the epitympanum.

5. Partial mastoidectomy is done in the usual way.

6. Fenestration is performed with the creation of a wide fistula as far forward as possible in order to facilitate reaching downward to the ampulla and vestibule. During the entire operation continuous irrigation is provided by means of water trickling on the burr from a very thin tube in the handpiece.

7. For tamponade of the semicircular canal some small wedge-shaped pieces of cartilage, measuring 0.5 to 1 mm. in thickness and some millimeters in length, are made from a bit of the cartilage from the concha. Under good enlargement, preferably with a microscope, five or six such small pieces of cartilage are introduced as far as possible forward in the fistula of the semicircular canal and as far as possible downward toward the vestibule, so that a complete packing is obtained. A special instrument is used for this purpose: a silver spatula consisting of a paper-thin, 1 by 5 mm. blade on a fine shaft. With this, the membranous canal is carefully pushed aside, usually most expediently to the contrafacial side, while the small pieces of cartilage are introduced one by one with the help of a very fine, needle-like hook, between the spatula and the bony wall of the semicircular canal without injuring the membranous labyrinth. Microscopic examination is made to see that the canal is completely compressed after the termination of the tamponade.

8. Tympanosympathectomy is performed with opening of the bony canals which afford passage for the nerves and complete evacuation by means of Lempert's angled raspatory and specially constructed, extremely gracile curettes of 0.25 to 0.3 mm. diameter.[2]

9. The chorda tympani nerve and the tensor tympani tendon are cut, and possibly also the stapedius muscle tendon.

10. The flap is carefully placed over the fistula. A tamponade is then carried out.

The selection of patients and the preoperative treatment have been carried out with the greatest possible care. In order not to expose a patient to a serious operation without urgent reason when the probable result cannot be foretold, only the severest cases have been chosen, and the operation has been undertaken only after very careful examination and after varied conservative treatment over a long period. All patients have suffered such great discomfort that they considered the condition unendurable. The determination of vertigo and hearing offers less difficulty, as a rule, than the extremely varied tinnitus disturbances. Attempts have been made to differentiate between inner and outer tinnitus, between vestibular irritation factors and psychogenic, but neither carefulness nor experience is sufficient in these cases to make definite grouping possible.

In consideration of the therapeutic results, classification of the cases as histamine-positive and histamine-negative, as many have observed, is also unreliable. The cases have been judged mainly according to Atkinson's principles. In accordance with these, there are two groups which may be classified with considerable certainty: the definitely positive and the definitely negative. Between these, however, there is a third uncertain group, which appears to include more than one-third of all cases. Whether these should be dealt with from a histamine or an antihis-

2. Frenckner,[1] p. 353.

tamine point of view is problematic, of course, but even with definitely positive or definitely negative cases the results of the aforementioned therapy are particularly erratic. The only certainty seems to be that administration of vasodilator drugs to histamine-positive patients is accompanied by disastrous, or at least poorer, results.

All patients are fully tested for allergy and specifically desensitized in case of positive reaction.

Before operation, conservative treatment of long duration with all modern therapeutic methods has been tried, as for example, the Mygind-Dederding-Furstenberg dry diet, sedatives, calcium, atropine, vitamins, nicotinic acid, and various histaminic or antihistaminic antiallergic preparations. Psychogenic disturbances have not been considered as absolute contraindications up to the present time, as even with the risk of less effective results it has been desirable to attempt operation in all the most serious cases.

Before an account of the results is presented, I wish to point out that my personal optimism is not too great and also to emphasize that, of course, the period of observation has been altogether too short to form definite conclusions. As the primary results have been rather good, however, I consider it both justified and desirable to give a preliminary report now.

In judging the results, it should be taken into account that those cases in which operation has been performed up to the present time have been the worst possible, those in which the symptoms have invalided the patient and no other treatment has proved effective. Despite this, in the clear cases of Ménière's disease the effect of the operative treatment has been very encouraging. On the other hand, an extremely pronounced psychogenic component has been strongly dominant in some cases even after the operation. This has made judgment more difficult and has had a particularly unfavorable effect on the results in such cases.

The observation period varies from nine months to two years. During this time operation has been carried out in 13 cases. The patients have been confined to the hospital two to four weeks after the operation and thereafter have been observed and treated as ambulatory patients. Notation of noise, vertigo, nystagmus, and other subjective or objective symptoms has been made once or several times daily during the first postoperative period; thereafter, several times a week, and later, several times monthly. The hearing has been tested at greater intervals. All control examinations have been made by or supervised by my associate, Dr. Preber, who is specially trained in otoneurology.

In one case the disease was bilateral, but with symptoms predominantly in one ear, at least in the beginning. In all other cases the condition has been unilateral.

In order to present a view of the postoperative course, the 13 cases have been compared in three tables showing the results as regards the three main symptoms: hearing, tinnitus, and vertigo.

Table 1 gives a survey of the condition of hearing before and after operation. Under the headings Whispering and Conversation, the distance in meters at which the patient perceived whispering and conversation is noted; under Audiometer, the loss of hearing in decibels is recorded. All audiometric values refer to medium reduction for 512, 1024, and 2048 CPS. In the next to the last column, the loss or gain in the treated ear is noted from a comparison of the preoperative

TABLE 1.—*Condition of Hearing Before and After Operation*

Case No.	Sex	Operation Date	Hearing Before Operation			Hearing After Operation												Improvement or Impairment	
						One Month			Three Months			Half a Year			¾-One Year				
			Whispering*	Conversation*	Audiometer*	Whispering	Conversation	Audiometer	Whispering	Conversation	Audiometer	Whispering	Conversation	Audiometer	Whispering	Conversation	Audiometer	Treated Ear	Untreated Ear
33/49	F	5/13/49	0	0.4	+52	...	...	....	...	...	....	0	0.4	+55	0	0.4	+53	+1	+27
5/50	M	2/23/50	0	0.1	+63	...	...	....	a. c.	0.2	+95	0	0	+100†	0	0	+100	+37	+32
8/50	F	3/ 3/50	a. c.	0.5	+67	...	...	....	0.1	0.5	+57	0	a. c.	+100†	0	0	+100	+33	+11
15/50	M	4/ 4/50	0‡	0	0	...	...	....	...	...	....	0	0	0	0	0	0	0	+7
22/50	M	5/30/50	0	0.2	+63	...	...	....	0	a. c.	+90	0	0	+100†	0	0	+100	+37	+20
27/50	F	6/15/50	1	8	+10	0	0.5	+30	0	0.5	+45	0	0.25	....	0	0.25	+40	+30	+1
29/50	F	7/ 3/50	0	a. c.	+72	a. c.	1	+50	a. c.	1	+50	0	0.3	....	0	0.2	+57	+15	+1
33/50	M	7/10/50	0.1	0.4	+37	0	a. c.	+53	0	a. c.	+100	0	0	....	0	0	+100	+63	+8
34/50	F	7/17/50	0	0.2	+57	0	a. c.	+55	0	a. c.	+56	0	0	....	0	0	+100	+43	±0
35/50	M	8/ 2/50	0.1	2	+35	...	...	....	0	a. c.	+68	0	a. c.	....	0	0	....	+33	±0
36/50	M	8/ 3/50	a. c.	0.5	+57	0	0	+100	0	0	....	0	0	+100	0	0	+100	+43	±0
39/50	M	9/12/50	a. c.	0.5	+42	a. c.	0.7	+47	0.1	0.5	+57	0	0.2	+45	0	0.2	+45	+3	+1
44/50	F	9/19/50	5	>5	+27	0.1	5	+38	a. c.	0.75	+45	0.4	5	+30	0.4	5	+30	−3	+3

* All audiometric values give average increase or decrease in decibels for 512, 1,024, and 2,048 CPS, all distances in meters.
† Weber response lateralized to treated ear.
‡ Deafness in connection with parotitis, 1936.

examination with the last after the operation. In the last column, the same comparison for the untreated ear is noted. The last control examination was made in May, 1951, thus at least nine months after the operation.

In six cases the hearing loss at the last examination was 100 db., i. e., none of the aforementioned frequencies were audible. Three of these patients perceived lower tones, however, and lateralized toward the treated ear. The other three lateralized inversely and did not perceive sound. The latter were, accordingly, totally deaf, whereas the former had residual hearing. The hearing loss in these six cases from the time of the preoperative examination until the last control varied between 33 and 63 db. From a practical point of view, this has no significance, as the hearing was equally useless before the operation, but it is of theoretic interest that the organ of Corti could be degeneratively destroyed in only three of the cases.

One patient (15/50) was already completely deaf before operation because of parotitic damage in 1936. His entire picture was thus different from that of the others, but his discomfort was so great and was enough of the Ménière type that his condition was designated as pseudo-Ménière and he was treated like the rest.

In one case (29/50) a definite improvement in hearing was obtained in the treated ear. This might be due to the fact that before the operation the patient could not perceive and differentiate sounds because of a violent tinnitus. All the other patients presented a slight or moderate postoperative deterioration; it was less than expected in several cases, however, as removal of the ossicle chain alone should be accompanied by a hearing loss of approximately 20 to 30 db.

As it has proved to be technically possible, however, to carry out the entire operation, including tympanosympathectomy, without injuring the auditory ossicles, the technique in operations performed later than the series described herein has been changed so that the position of the ossicles is not disturbed, and it is thus to be hoped that deterioration of the hearing may be avoided.

The hearing in the untreated ear has been improved objectively, and especially subjectively, probably because of decreased tinnitus.

As has already been pointed out, it is altogether too soon to draw conclusions as to how the hearing will definitely develop, as it is still impossible to determine the degenerative alterations which might occur during the continued progress and later damage the sound-perceiving apparatus. From observations up to the present day it seems, however, to be evident that the hearing, as in the majority of cases of Ménière's disease, regardless of operative or other treatment, varies rather greatly from one occasion to the next. Whether even the tendency to progress, which is the rule in untreated patients, will remain unaltered or cease at the time of operation, or if degenerative changes will speed up the deterioration, only continued observation can prove.

All the different noises which may occur have for simplification been combined here under the name tinnitus. As a rule, the sound has been continuous, sometimes with pulsating or irregular intermittent variations. High or low tones may be interchanged with humming, roaring, or hissing, but usually one of the types is predominant. For the majority of patients, the tinnitus alone has been so malignant that it has completely or partially invalided them, as far as working was concerned, and has resulted in psychic trauma.

The postoperative effect, as is evident from Table 2, has been very much the same in all cases. When the patient is operated on under local anesthesia, he is

questioned during the first part of the operation as to the type of noise he hears, which is usually unchanged at that time. Immediately after the tympanosympathectomy, the patient is again questioned, if he has been sufficiently clearheaded, and then, without exception, the answer has been that all noise is gone. In the rest of the cases, either upon being questioned or spontaneously, after the termination of the operation, the patient has remarked with surprise, "Well, now all noise is gone." This cannot be an effect of the local anesthesia, or solely of the tympanosympathectomy, because in about 100 cases in which I have performed this operation in the same manner, as in other disease conditions, *inter alia* in cases of otosclerosis, I have not achieved this striking effect. Tinnitus has been absent

TABLE 2.—*Effect of Operation on Tinnitus*

Case No.	Sex	Operation Date	Tinnitus* Before Operation			Tinnitus* After Operation							
			Type	Right	Left	Immediate	Next Day	One Week	One Month	Three Months	Half a Year	¾-One Year	1½ Year
33/49	F	5/13/49	Continual low tone	—	++ Op.	0	(+)	(+) 0	(+) 0	0	0	0	0
						Sometimes a new metallic ringing							
5/50	M	2/23/50	High tone steam whistle	+++ Op.	+	0	++	+	(+)	(+)	(+) 0	(+) 0	...
8/50	F	3/ 3/50	Low tone waterfall	—	+++ Op.	0	+	(+)	0	0	0	(+)	...
15/50	M	4/ 4/50	0	—	— Op.	—	—	—	—	—	—	—	...
22/50	M	5/30/50	Low tone waterfall	+++ Op.	(+)	0	(+)	0	0	0	0	0	...
27/50	F	6/15/50	Low tone waterfall	+++ Op.	—	0	+	(+)	(+)	(+)	(+)	+	...
29/50†	F	7/ 3/50	Intense waterfall	..	+++ Op.	0	+	(+)	(+)	(+) +†	++	+++	...
33/50	M	7/10/50	Roaring, hissing	++ Op.	.....	0	(+)	(+) 0	(+) 0	(+) 0	+	(+)	...
34/50	F	7/17/50	Waterfall	.....	++ Op.	0	(+)	(+)	(+)	(+)	+	+	...
35/50	M	8/ 2/50	High, unendurable tone	.....	+++ Op.	0	(+)	(+)	(+)	0	(+)	...	...
36/50‡	M	8/ 3/50	High tone, telephone wire	++	++ Op.	0	(+)	(+)	(+)	(+) +‡	++	++	...
39/50	M	9/12/50	High tone, telephone wire	.....	+++ Op.	0	+	+	(+)	+	++	++	...
44/50	F	9/19/50	Low tone roaring	++ Op.	++	0	+	(+)	0	0	(+)	(+)	...

* +++ indicates very severe tinnitus; ++, severe or moderate tinnitus; +, not troublesome or slight tinnitus; 0, no tinnitus.

† In custody since 1949 for manic-depressive mental disease. Still very instable, therefore information uncertain.

‡ Same symptoms from both ears, left more serious; operation. Two months after operation (10/12/50). Ménière attack two hours (vertigo + tinnitus + nystagmus toward untreated ear). Caloric reaction before attack negative; after, late positive.

postoperatively between 4 and 24 hours in the various cases. Thereafter, a certain noise has returned; the first day it has been quite strong, but later it has decreased, and from one week after the operation tinnitus has been either completely absent or so slight that it was not troublesome. There are exceptional cases: Case 29/50, which cannot be judged because of psychic disorder; Case 36/50, in which the tamponade of the semicircular canal loosened, and Case 39/50, with noise which was periodically better but periodically worse. This last case is the only one in which the cause cannot be explained and in which, as regards tinnitus, the results are less satisfactory. The patient was very nervous and psychically labile, to be sure, but hardly more than others suffering from severe Ménière's disease.

Cases 36/50 and 34/50 demand special mention regarding both tinnitus and vertigo. Before operation, Patient 36/50 had similar discomfort from the two ears

but more severe from the left and, as the vertigo was thought to be provoked by the left ear, that ear was operated on. After the operation, there was very favorable progress, with practically no tinnitus in either ear, no vertigo, better hearing in the treated ear, and a completely new psychic condition, so that the patient was able to return to his usual work. At a casual visit to the hospital for observation two months after the operation, the hearing had just been tested and it had been found that there was no caloric reaction in the treated ear, when a sudden Ménière attack occurred, with vertigo, with tinnitus in the entire head, and with nystagmus toward the untreated ear. The attack ceased completely and instantly, after it had continued about three hours. At repeated caloric reaction testing, the result was found to be late positive. No symptoms of irritation remained. No subsequent attack occurred. The explanation is not certain, but presumably the tamponade of the semicircular canal was displaced for some reason and permitted circulation in the semicircular canal.

Case 34/50 shows practically the same course but without recurring tinnitus. Postoperative healing and improvement were relatively uneventful. After four months, slight suppuration occurred. In connection with this, there were attacks of vertigo and nausea; besides, the previously negative caloric reaction then became late positive. Hearing, which had deteriorated during the immediately preceding period so that only loud conversation was perceived ad concham, then disappeared almost completely, so that only shouting could be perceived and details of speech could not be discriminated. The patient still lateralized toward the treated ear in Weber's test. There was no repetition of the vertigo attack, but the patient complained of a certain sensation of pressure in the same side of the head. The explanation is probably the same as in Case 36/50. It is noteworthy that both these extensive changes in vestibular reaction occurred in connection with suppuration in the cavity.

The vertigo in all cases was very malignant. Before resorting to operation, I was convinced that the discomfort was unendurable and that conservative treatment of various kinds had not produced the desired improvement.

After the operation, of course, the same vertigo has occurred as after every fenestration. Other than this, however, there has been no appearance of vertigo in the form of attacks or other Ménière-like symptoms, with the exception of the chance attacks just described in Cases 34/50 and 36/50. This is shown in Table 3.

Such a favorable result with complete disappearance of all vertigo in all cases will probably not be permanent and must not be made the basis of continued estimation of operative indications. I am fully prepared to find a recurrence of some type of vertigo in some of these cases, as well as to find all cases in the future will not present the same immediate and complete improvement as has thus far been seen.

The caloric reaction has been negative at testing one month after the operation in all cases. In the first patient, 33/49, who was not treated in exactly the same way as the rest, however, the reaction subsequently returned. At that operation, instead of cartilage, a bit of the flap was pressed into the newly created labyrinthine fistula. In this manner the circulation in the semicircular canal was stopped temporarily, but probably the soft plug described shrank subsequently, with resultant reopening of the lumen of the semicircular canal. However, the patient has not had any of her earlier subjective symptoms again.

TABLE 3.—*Effect of Operation on Vertigo*

			Vertigo*							Caloric Reaction					
				After Operation							After Operation				
Case No.	Sex	Operation Date	Before Operation	One Day	One Week	One Month	Three Months	Half a Year	One Year	Before Operation	One Month	Three Months	Directional Preponderance	Histamine Test	Allergy Test
33/49†	F	5/13/49	+++	+	0	0	0	0	0	Normal	Neg.	Late† pos.	....	Pos.	Pos.
5/50	M	2/28/50	+++	(+)	0	0	0	0	0	Normal	Neg.	Neg.	....	Neg.	Pos.
8/50‡	F	3/ 3/50	+++	+	0	(+)‡	0	0	0	Normal	Neg	Neg.	+	Neg.	Neg.
15/50	M	4/ 4/50	+++	+	0	0	0	0	0	Normal	....	Neg.	+	Neg.	Neg.
22/50	M	5/30/50	+++	(+)	0	0	0	0	0	Normal	....	Neg.	....	Pos.	Neg.
27/50	F	6/15/50	+++	0	0	0	0	0	0	Normal	....	Neg.	+	Neg.	Neg.
29/50	F	7/ 3/50	++	+	(+) 0	0	0	0	+ 0	Normal	....	Neg.	+	Weak pos.	Neg.
33/50	M	7/10/50	+++	+	0	0	0	0	0	Normal	....	Neg	....	Neg.	Neg.
34/50	F	7/17/50	++	+	0	0	0	0	0	Normal	...	Neg.	+	Pos.	Neg.
35/50	M	8/ 2/50	+++	+	(+)	0	0	0	....	Normal	....	Neg.	....	Neg.	Neg.
36/50§	M	8/ 3/50	+++	0	0	+ 0§	0	+	....	Normal	Neg.§ late pos.	(+)	(+)	Pos.	Neg.
39/50	M	9/12/50	++	++	0	0	0	0	....	Normal	Neg.	Neg.	+	Not tested	Not tested
44/50	F	9/19/50	+++	+	0	0	0	0	....	Normal	Neg.	Neg.	+	Neg.	Neg.

* +++ indicates very severe vertigo; ++, severe vertigo; +, slight vertigo.
† At operation flap used as stopple for membranous canal.
‡ In connection with severe psychic trauma.
§ Same symptoms from both ears, left more serious; operation. Two months after operation (10/12/50) Ménière attack two hours (vertigo + tinnitus + nystagmus toward the untreated ear). Caloric reaction before attack negative; after, late positive.

As mentioned earlier, the caloric reaction returned four months after the operation in Case 34/50 and, two months after in Case 36/50.

In 8 of the 13 cases in which operation was performed, it has been possible to demonstrate a directional preponderance toward the untreated ear in the manner shown by Hallpike and Cawthorne in patients operated on by Cawthorne. Case 8/50 (Fig. 3) is cited as an example. About one month after the operation it was found that on rotation toward the treated ear, normal post-rotary nystagmus was obtained, whereas on rotation in the opposite direction, no nystagmus at all could be observed. After about half a year, a certain central compensation had been attained, so that in the latter rotary direction the post-rotary nystagmus

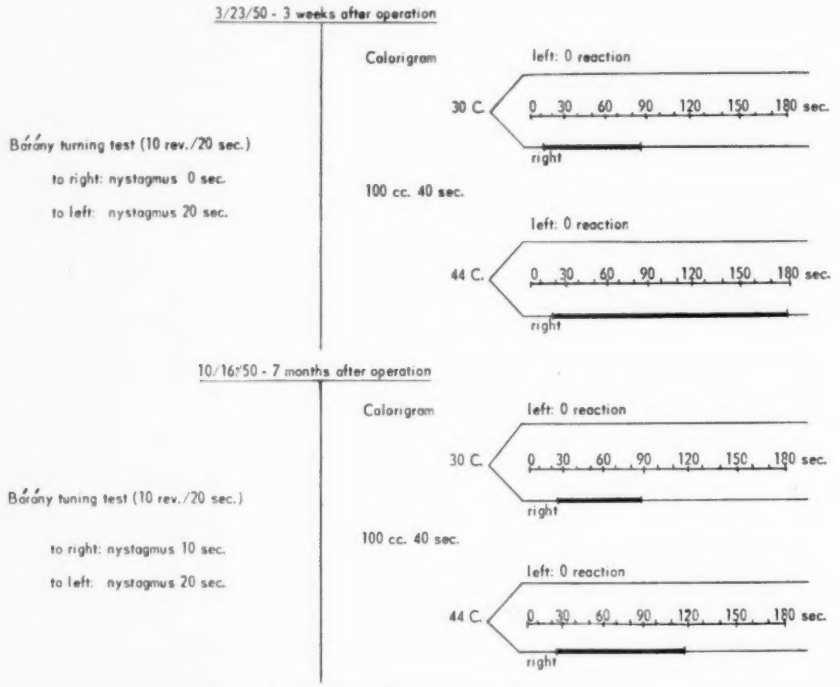

Fig. 3 (Case 8/50).—Postoperative caloric reaction.

was approximately half the normal. Calorigrams showed no caloric reaction in the treated ear. In the untreated ear, the postcaloric reaction obtained by flushing the ear with warm water was of more than twice the duration of that from cold, or, more exactly calculated, the ratio was 2.5:1. After half a year, that difference had decreased to a ratio of 1.2:1.

In the other seven cases, it has been possible to demonstrate that directional preponderance still remained 2 to 10 months after operation.

Thus, regarding the results obtained up to the present, it is possible to say that the symptoms of vertigo and tinnitus have been removed in an entirely satisfactory way. The objective of retaining usable hearing in those cases in which it is not already too much damaged at the time of the operation appears more difficult to

attain. With increased experience and possibly with the aid of certain modifications in the technique, it seems, however, that even in this respect there are certain possibilities of a more favorable course.

As was mentioned earlier, all cases in this series were particularly advanced, with very poor hearing before the operation. Table 1 shows that only two of the patients (27/50 and 44/50) had usable hearing in the affected ear before operation. Patient 27/50 has observed, it is true, that his hearing has deteriorated but can, nevertheless, use the treated ear as reserve. Patient 44/50 considers that his hearing has deteriorated only inconsiderably and is not inconvenienced thereby. In the rest of the cases, the preoperative hearing, impaired to the point of practical uselessness, has further deteriorated but has not completely disappeared, except in three cases. This indicates that the vestibular function can probably be abolished without too great disruption of the acoustic. In later cases, not belonging to the present series, both fenestration and tympanosympathectomy have been performed without disturbing the ossicle chain, and that change alone should mean better resultant hearing.

I shall, therefore, continue for the present on the way paved by these preliminary studies, and hope soon to be able to present results which, on the basis of a longer period of observation, may permit more dependable conclusions in either a positive or a negative direction.

The operative methods described perhaps seem complicated and made up of so many separate steps that it is impossible to judge what has the greatest effect on tinnitus. Now that experience has been widened through collection of a large amount of material, including cases of both Ménière's disease and of tinnitus of other origin, the objective is to eliminate one detailed step after another (for example, cutting of the corda tympani nerve, the tensor tympani muscle tendon, or the stapedius muscle tendon) and thereby to obtain a conception of the result. As far as I am able to judge, the most important steps, which should constitute the definitive operation, seem to be (1) fenestration, (2) tamponade of the semicircular canal, and (3) tympanosympathectomy.

SUMMARY

Operative methods used earlier, which consisted either of cutting the vestibular nerve or of destructive operations on the labyrinth, usually resulted in relief of the vertigo symptom but not in decrease of the tinnitus. In addition, the labyrinthine operations were intended to destroy the existent hearing. The operative method reported herein is intended to eliminate the vertigo and tinnitus symptoms, or at least to diminish them to the point of freedom from discomfort, and to protect the residual hearing as well. This is achieved by means of (1) relief of the intralabyrinthine pressure through fenestration, (2) abolition of the vestibular function through tamponade of the vestibule, and (3) an attempt to affect tinnitus through tympanosympathectomy and cutting of the corda tympani nerve, the tensor tympani muscle tendon, and the stapedius muscle tendon.

The cases in which operation was performed comprise an experimental series of the most serious cases which could be procured. All patients had been practically invalided by their disease. The results were completely satisfactory in respect to vertigo and tinnitus. It was possible to retain the hearing in most cases, although it deteriorated somewhat as result of the operation. In later cases, the technique has been changed, so that it is hoped the hearing may be preserved without further loss.

Karlavägen 41.

SOME ASPECTS OF HISTAMINE IN MÉNIÈRE'S DISEASE

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IN THE investigation into Ménière's disease, its etiology and its treatment, both conservative and operative, which is now proceeding at the Ear Department of Södersjukhuset, attention has been directed to histamine and the role that it may play in that disease. Since Miles Atkinson [1] discussed the significance of histamine in Ménière's disease the subject has aroused keen interest. Atkinson classified the disease into two forms with respect to etiology. He believed that one form was due to histamine and that in this form the vertigo with its attendant complications was attributable to vasodilatation, the patients being sensitive to the histamine in their own blood and tissues. In contradistinction, in the second form he classed those cases in which the patients are not sensitive to histamine, the vertigo being primarily due to vasoconstriction. On this basis Atkinson outlined his treatment and suggested that histamine-sensitive patients should undergo desensitization with histamine, first in small doses, then in increasing doses. Those not sensitive to histamine, i. e., patients presenting primary vasoconstriction, he treated with nicotinic acid, beginning with 0.25 mg., increasing to 0.75 mg., and finally reaching a dose of 100 to 200 mg. He began with intravenous administration and subsequently continued with intramuscular and oral administration. To ascertain whether in individual cases the disease was due to increased sensitivity to histamine, he made intradermal histamine tests, using 0.01 mg. of histamine dihydrochloride injected intracutaneously. After intervals of 5, 10, 15, and 20 minutes, he measured the size of the wheal and of the erythema surrounding it. He regarded as a positive reaction a wheal of 13 to 19 mm. with an erythematous zone of 50 to 64 mm. and the presence of a so-called pseudopod at least 25 mm. in diameter, after five minutes. (Fig. 1).

The pseudopod reaches its maximum after five minutes, then commences to fade and disappears after 15 to 20 minutes. According to Atkinson, it often persists in the form of a red line even after 30 minutes. Atkinson regards this as a positive reaction. If small pseudopods occur on the wheal, he considers it a negative reaction. If these pseudopods are somewhat larger, the reaction is doubtful and the test should be repeated after 48 hours with double the dose. Should this test produce the same type of pseudopod or none at all, the patient would be considered insensitive to histamine. A major pseudopod, however, would indicate sensitivity to histamine. According to Atkinson, the occurrence of the pseudopod is therefore very important. It has been the subject of considerable discussion, and many attempts

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1. Atkinson, M.: Observations on Etiology and Treatment of Ménière's Syndrome, J. A. M. A. **116**:1753-1760 (April 19) 1941.

have been made to explain it, though hitherto without much success. Certain British authors have suggested that the pseudopod develops when some of the histamine is injected subcutaneously.

For a reaction to be classed as negative, Atkinson specifies a wheal of 8 to 13 mm. after five minutes, a sharply delimited border, and an erythematous zone of 30 to 38 mm. The reaction fades after 10 minutes and has disappeared completely after 20 minutes. This is a completely negative reaction. It was mentioned above that an injection of 0.01 mg. of histamine dihydrochloride is given; calculated as histamine base, this represents 0.0057 mg. of histamine. For desensitization with histamine, Atkinson recommends 0.01 mg. given subcutaneously, gradually increased to 0.1 mg., with injections every two or four days. When the maximum has been reached, one injection is given per month and subsequently one every three or six months. Atkinson thus recommends protracted and fairly intensive treatment with histamine, though only in such cases as present positive histamine reactions. He

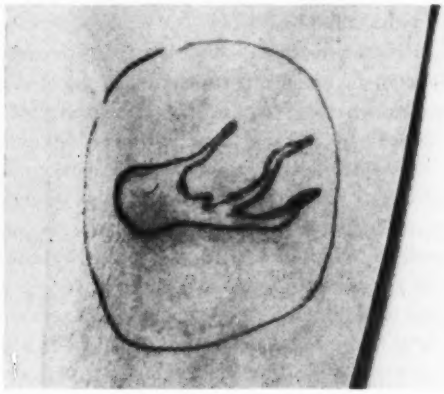

Fig. 1.—Positive histamine skin test.

reports good results with desensitization of the histamine-sensitive patients with Ménière's disease.

At about the same time as Atkinson, in 1941, Horton,[2] in a paper on the use of histamine in Ménière's disease, reported good results with treatment consisting of 0.1 to 0.2 mg. of histamine base administered subcutaneously two to four times a week. In addition to using histamine base instead of dihydrochloride, Horton administered larger doses than those suggested by Atkinson. Atkinson,[3] in his paper of 1943, stated that roughly one-fifth of all patients with Ménière's disease were sensitive to histamine.

The above-mentioned researches naturally aroused considerable interest, and investigators in many parts of the world began to study and employ the examinations and therapeutic measures advocated by Atkinson. Other investigators, however, did not fully subscribe to Atkinson's views. In the mid-forties, studies of

2. Horton, B. T.: Use of Histamine in Ménière's Disease, Surg., Gynec. & Obst. **72**:417-420 (Feb., No. 2A) 1941.

3. Atkinson, M.: Diagnosis and Treatment of Ménière's Syndrome, Arch. Otolaryng. **37**: 40-53 (Jan.) 1943.

Ménière's disease with special reference to histamine testing and nicotinic acid treatment were undertaken at Karolinska Sjukhuset, Stockholm. A relatively small number of patients were found to be histamine-sensitive, i. e., there were very few positive histamine reactions, and histamine treatment had but little effect. These results were communicated by S. Åberg to the Swedish Oto-Laryngological Association. However, Åberg did obtain very good results with nicotinic acid.

Farmer,[4] in a paper on the role of histamine in allergic conditions, published by *The Journal of Allergy* in 1945, suggested that the intradermal histamine test has no diagnostic value in so far as the differentiation between allergic and nonallergic patients is concerned. The same view had been expressed in 1943 by Raun-Ryberg, who obtained no positive reactions with the skin test reported by Atkinson. Writing in *The Journal of the American Medical Association*, Feinberg,[5] in 1946, reported the results of several years' observations with special reference to histamine in Ménière's disease, pointing out that the tolerance to histamine does not increase even after prolonged desensitization to that substance. Rainey,[6] writing in 1945, was not in agreement with Atkinson on the classification of vasodilator and vasoconstrictor forms of Ménière's disease and did not attach any positive value to intradermal tests. He used histamine treatment in all cases of Ménière's disease and reported good results, regardless of positive or negative intradermal tests. In a paper in 1947, Williams,[7] of the Mayo Clinic, described studies of Ménière's disease and tests with histamine diphosphate in higher concentrations, as well as treatment with histamine or nicotinic acid. His conclusions were as follows: 1. No concordance exists between skin tests with histamine and results of treatment. 2. Skin tests with histamine are worthless both in diagnosis and as a guide to treatment. 3. These circumstances do not, however, argue against Atkinson's classification of primary vasodilator or vasoconstrictor types. Williams reported equally good results with histamine and with nicotinic acid. My associates and I, however, are of the opinion that nicotinic acid should not be given in those cases in which the condition is due to primary vasodilation. In a paper published as early as 1941, Lillie stated that treatment with histamine, and with nicotinic acid produces equally good results, without any need to consider histamine skin tests. Passe and Seymour,[8] writing in the *British Medical Journal* in 1948, emphasized the major significance of vasoconstriction in Ménière's disease and stated that it is especially the constriction of the internal auditory artery that is influenced by that of the basilar artery. This state of contraction is due to the nerve plexus surrounding the vertebral artery and its branches from the thoracic part of the sympathetic trunk and the inferior cervical ganglion. It is therefore necessary above all to prevent the flow of

4. Farmer, L.: Evaluation of Histamine Intradermal Test as General Indicator of Allergy, J. Allergy **16**:44-47 (Jan.) 1945.

5. Feinberg, S. M.: Histamine and Antihistaminic Agents: Their Experimental and Therapeutic Status, J. A. M. A. **132**:702-713 (Nov. 23) 1946.

6. Rainey, J. J.: Treatment of Ménière's Syndrome, New York J. Med. **45**:1753-1755 (Aug. 15) 1945.

7. Williams, H. L.: Present Status of Diagnosis and Treatment of Endolymphatic Hydrops (Ménière's Disease), Ann. Otol. Rhin. & Laryng. **56**:614-646 (Sept.) 1947.

8. Passe, E. R. G., and Seymour, J. S.: Ménière's Syndrome: Successful Treatment by Surgery on the Sympathetic, Brit. M. J. **2**:812-816 (Nov. 6) 1948.

impulses through this plexus. For this reason Passe and Seymour perform stellectomy, with division of the preganglionic fibers of the first and second thoracic ganglia.

A paper published by Kodicek, Taylor, and Bateman [9] in 1950 concerning the medical treatment of Ménière's disease is of considerable interest. It describes the results obtained in 53 patients treated according to the method of Miles Atkinson at St. Thomas' Hospital, London. Of the 53 patients, 28% were found to be histamine-positive and were treated with histamine desensitization; 72% were histamine-negative or doubtful, and received nicotinic acid. With regard to the latter, the authors recommended prolonged serial treatments. They claimed to have obtained better results with nicotinic acid than with histamine. In the discussion which followed the reading of their paper, some doubt was expressed as to the value of histamine tests, and treatment with nicotinic acid was said to yield better results than previously known routine treatments.

CLINICAL STUDIES

In view of all these conflicting reports on histamine and its role in Ménière's disease, we felt it would be worth while to submit this question to critical appraisal, particularly as we had been occupied for some time with the study of histamine in the blood and tissues in allergic rhinopathy, besides having studied histamine in the blood, e. g., in otosclerosis. Hence it was natural in planning the treatment of Ménière's disease to bear in mind histamine, especially as Atkinson had stated that sensitivity to histamine is relatively great and of frequent occurrence and that in such cases fairly good results can be obtained by desensitization. At our clinic, therefore, in every case of vertigo, and particularly in the disease we regarded as Ménière's syndrome, we carried out routine intradermal skin tests according to Atkinson's method, with 0.01 mg. of histamine dihydrochloride, and read the reactions after 5, 10, 15, and 20 minutes. In so doing, we paid special attention to the circumstances reported by Atkinson.

Concurrently with each skin test we usually made a test on the other arm with isotonic sodium chloride solution. At the same time blood samples of 20 ml. were taken, treated with trichloroacetic acid, and sent to the proper laboratory at Karolinska Sjukhuset for determination of the histamine content. Atkinson made no reference to this consideration in his investigations. Our purpose was to study the blood histamine content in Ménière's disease and to see whether any correlation existed between high blood levels of histamine and histamine-positive skin reactions, as well as to study the effect of histamine treatment.

As yet the series is too small to warrant any far-reaching conclusions. It comprises 53 cases of Ménière's disease, and our aim was, of course, in the first place to treat these patients conservatively, primarily by Furstenberg's method, i. e., reducing intake of fluids and giving large doses of ammonium chloride ("salmin"). In the second place, we recommended nicotinic acid treatment or, if the patient was sensitive to histamine, desensitization to that substance. As yet we have had time to treat only a few patients with histamine, but we hope in the near future to complete a

9. Kodicek, J.; Taylor, L. R. S., and Bateman, G. H.: Medical Treatment of Ménière's Disease, Proc. Roy. Soc. Med. **43**:283-290 (April) 1950.

careful study of this form of therapy, so as to gain a clear idea of the role of histamine and to determine whether any decisive importance can be ascribed to it in the treatment of Ménière's disease.

I now proceed to the blood histamine and to our results of histamine skin tests and determination of the histamine content in the blood.

A few investigations have been conducted by other authors to see whether any relationship exists between blood histamine and allergic conditions, especially in connection with acute attacks. Determinations of the histamine content have been made both during and between acute asthma attacks. The relationship of blood histamine and eosinophilia has been studied, too. These investigations have been conducted notably by Randolph and Rackemann,[10] who first made histamine determinations in 20 normal persons as a control series. These persons showed a mean white blood cell count of 6,670, including 2.5% eosinophiles. The average content of histamine base in the blood was 0.045γ per milliliter, the range being 0.019 to 0.071γ. In cases of bronchial asthma, blood samples were taken at the height of the attacks, the mean value for histamine base then being 0.088γ per millimeter. Between attacks the histamine base value was 0.054γ. The results thus disclosed a moderate increase in the blood histamine during acute asthma attacks. This variation is less than that reported by previous investigators. Randolph and Rackemann were unable to find any constant relationship between the eosinophile count and the histamine content in the peripheral blood. B. Rose [11] points out (1) that relatively little is known about the physiologic significance of histamine, and (2) that most of the knowledge of its action is of an indirect nature. The histamine in the blood and tissues is either free or bound to the cells. Code [12] was the first to show that from 70 to 90% of the blood histamine occurs in the white blood corpuscles, the remainder circulating freely in the plasma. Similarly, the tissue histamine is bound to the tissue cells. With regard to the histamine content in allergic conditions, Rose mentions that in normal persons it proves to be remarkably stable. Rose, unlike Randolph and Rackemann, has not been able to observe any rise in the histamine content during asthma attacks. In an attempt to explain the occurrence of a normally high or low histamine content in the blood of patients with allergic symptoms, Rose observed the effect of both subcutaneous and intravenous injection of histamine and its influence on the histamine content in the blood. In all cases he found redness of the face and throat, whether the patients were allergic or not. Allergic symptoms, such as transient asthma, urticaria, or allergic dizziness, could be provoked only in those persons who actually suffered from these symptoms. Thus labored breathing could be observed only in asthmatics.

Raun-Ryberg repeated skin tests by the Atkinson method on allergic patients, without finding reactions that could be classed as positive according to Atkinson. To study the normal course of the reaction, he gave 102 healthy nonallergic persons injections of 0.01 mg. of histamine in 0.1 cc. of isotonic sodium chloride solution and read the reactions after 5, 10, 15, 20, and 35 minutes. The erythematous zone was found

10. Randolph, T. G., and Rackemann, F. M.: Blood Histamine Level in Asthma and in Eosinophilia, J. Allergy **12**:450-456 (July) 1941.

11. Rose, B.: Role of Histamine in Anaphylaxis and Allergy, Am. J. Med. **3**:545-559 (Nov.) 1947.

12. Code, C. F.: Mechanism of Anaphylactic and Allergic Reactions: Evaluation of Role of Histamine in Their Production, Tr. Am. Laryng., Rhin. & Otol. Soc. **50**:217-240, 1946.

to be largest in the 10-to-20 year age group and decreased with increasing age, the values being as follows: up to 10 years, 37 mm.; 10 to 20 years, 57 mm.; 20 to 30 years, 54 mm.; 30 to 40 years, 48 mm.; 40 to 50 years, 41 mm.; 50 to 60 years, 39 mm., and over 60 years, 35 mm. The diameter of the macula ranged between 6 and 20 mm., the mean value being 13.2 mm. The size was not dependent on age. These findings, of course, were in healthy persons, i. e., a particular series of normal persons. Raun-Ryberg then examined patients with bronchial asthma and urticaria, finding that erythema diverged by +4 mm. and the maculae by —1 mm. His conclusion is that the histamine skin tests do not determine the allergic character of this disease. Atkinson, of course, asserted first and foremost that with the help of these skin tests he could differentiate allergic and nonallergic individuals, this on the theory that one kind of allergy is tantamount to increased sensitivity to histamine. Raun-Ryberg contends, however, that allergic and nonallergic patients cannot be differentiated by means of intradermal histamine tests.

BLOOD-HISTAMINE STUDIES

The present investigations of histamine in the blood were based on the possibility that a certain liberation of histamine may occur from the tissues to the blood in

TABLE 1.—*Histamine in Venous Blood in Micrograms per Milliliter*

	Range	$M \pm \Sigma (M)$
Normal cases	0.0060-0.0678	0.0383 ± 0.0080
Otosclerosis	0.0090-0.0750	0.0341 ± 0.0030
Ménière's disease	0.0000-0.1080	0.0282 ± 0.0028
Negative skin test	.....	0.0305 ± 0.0135
Positive skin test	.....	0.0261 ± 0.0029

acute attacks of Ménière's disease and that this increased content may be present in the blood for a time. As a rule, we were unable to make histamine determinations during acute attacks; they were made mostly in the intervals between, or a day or so after, the acute attacks. For purposes of comparison we made serial histamine determinations in the blood of 40 patients with otosclerosis, the mean value being 0.0341 ± 0.0030γ per milliliter, with variations from 0.0090 to a maximum of 0.0750γ per milliliter.

In another series of nine controls, consisting of patients with deviation of the nasal septum or with chronic tonsillitis who had been admitted for surgical treatment, the values ranged between 0.0060 and 0.0670γ per milliliter, the mean value being 0.0383 ± 0.00802γ, which is very close to that in the otosclerosis cases. The patients in this series were given skin tests with histamine dihydrochloride. We have tabulated the blood histamine values in the 53 patients with Ménière's disease that we treated at Södersjukhuset, the mean value amounting to 0.0282γ per milliliter of blood (Table 1). This value is lower than those found in the controls and the otosclerosis patients previously mentioned. It should be observed, however, that the blood histamine values were not determined during acute attacks of vertigo, but usually immediately after acute attacks or during free intervals. On classifying the vertigo patients with respect to positive and negative skin tests, the blood histamine content is found to be higher in the latter category. However, the difference is very small and does not permit any definite conclusions (Table 1).

In these 53 cases we also made eosinophile counts, finding a mean value of 3.29% eosinophiles, which is well within the normal range. As mentioned above, we made intradermal tests with histamine dihydrochloride in all cases (Table 2 and Fig. 2).

After five minutes we found a mean value of 12.9 ± 0.57 mm. for the macula and 37.3 ± 3.37 mm. for the erythema. This is below the value that Atkinson regarded as positive. Ten minutes after injection of the histamine, the values had increased somewhat, to 15.8 ± 0.59 mm. and 45.4 ± 2.93 mm., respectively. After 15 minutes the macula had a diameter of 16.3 ± 0.78 mm., and the erythema 45.4 ± 2.40 mm. After 20 minutes the values were 18.3 ± 0.93 mm. and 46.2 ± 3.70 mm., respectively. Thus the highest value for the macula occurred after 20 minutes and was within the limits of what Atkinson classed as positive. However, we must make a reservation here for the possible occurrence of the pseudopod. As regards the erythema, the mean value was below that classed by Atkinson as positive. Particularly worthy of note here is that both macula and erythema in this series persisted so long, and indeed that the maximum values occurred after 20 minutes, for according to Atkinson the highest value is found immediately after injection of the histamine. In normal cases no reaction persists

TABLE 2.—*Intracutaneous Histamine Tests in Ménière's Disease*

Reading After	Diameter of Macula in Mm.		Diameter of Erythema in Mm.	
	Range	$M \pm \Sigma\,(M)$	Range	$M \pm \Sigma\,(M)$
5 min.	7-25	12.9 ± 0.57	0-100	37.3 ± 3.37
10 min.	8-25	15.8 ± 0.59	0- 90	45.4 ± 2.93
15 min.	8-30	16.3 ± 0.78	0- 80	45.4 ± 2.40
20 min.	12-40	18.3 ± 0.93	0- 75	46.2 ± 3.70

as a rule after 10 to 15 minutes, whereas in the positive cases it is still present after 20 minutes. Most of the values here are within the range of the positive reaction, and the fact that the reaction persisted so long in our series suggests that we had positive histamine reactions in several of our cases with Ménière's disease.

All the cases of Ménière's disease have been grouped without regard to any allergy that may have been shown by intracutaneous testing with the standard series of tests. Now taking the individual cases and disregarding the occurrence of pseudopods, reactions that were positive according to Atkinson's criteria are found in 27 of the 53 cases, or 51%, a substantially higher value than that reported by other authors. If account is taken of the occurrence of pseudopods, i. e., projections from the erythema, without considering the size in millimeters, different values are found. Atkinson states that the pseudopods must be 25 mm. if they are to have any significant values. The cases in which pseudopods occurred numbered only 13 of the 53 with Ménière's disease included. In these cases, which certainly showed allergy, or, in other words, sensitivity to histamine, the blood histamine values ranged between 0.0102 and 0.084γ per milliliter, the mean value being 0.0290 ± 0.0035γ per milliliter. The variations were thus considerable. If those intradermal skin tests which produced pseudopods are now studied, and the extent of the macula and the erythema is compared, we find that only eight cases satisfy Atkinson's criteria for a positive reaction, whereas five fall below the range. The values show

that only a very few cases occurred with demonstrable sensitivity to histamine, i. e., 8 certain cases out of 53, or 15%. This figure is lower than the results recently reported from St. Thomas' Hospital, London, which showed sensitivity to histamine in 28%, as well as Atkinson's own figure of approximately 20%. Possibly the investigators at St. Thomas' Hospital were less restrictive in evaluating the reactions, not paying too much attention to the pseudopod, but considering mainly the extent of the macula and erythema. Histamine tests were made on all of our 53 patients with Ménière's disease, and, according to the last-named calculation, 27 of them (51%) were sensitive to histamine. The control series comprised normal persons who were known to have been free from acute or chronic disease or attacks of dizziness resembling Ménière's disease, as well as from allergy of any kind. We carried out 10 such tests on as many medical students, the values obtained being shown in Table 3.

The values, as will be seen, were very consistent, and the macula persisted a long time, being still about the same size after 20 minutes as it had been after 5 minutes (Fig. 2).

TABLE 3.—*Intracutaneous Histamine Tests in Normal Cases*

Reading After	Diameter of Macula in Mm.		Diameter of Erythema in Mm.	
	Range	$M \pm \Sigma (M)$	Range	$M \pm \Sigma (M)$
5 min.	5-13	10.3 ± 0.45	0-60	20.0 ± 8.3
10 min.	6-13	10.9 ± 0.43	20-70	51.0 ± 4.6
15 min.	6-13	11.0 ± 0.45	30-75	53.5 ± 3.5
20 min.	0-13	9.4 ± 1.17	0-70	46.0 ± 6.5

The values for the erythema after 5, 10, 15, and 20 minutes were, respectively, 20 ± 8.3 mm., 51 ± 4.6 mm., 53.5 ± 3.5 mm., and 46.0 ± 6.5 mm., the maximum value thus occurring after 15 minutes and the minimum after 5 minutes. These values correspond roughly to what Atkinson classes as a negative reaction. With this investigation of normal cases we wish to show that in our series the reaction persisted considerably longer than that shown by Atkinson. The latter said it usually disappears after 15 to 20 minutes, but we cannot subscribe to his view (Fig. 2).

In the eight cases which presented positive reactions with regard to macula, erythema and pseudopod, study of the blood histamine values shows that in six of them the values lie between 0.0105 and 0.0288 γ per milliliter, and in two they are higher (0.0438 and 0.0840 γ respectively). The mean value here is 0.03051 γ per milliliter. This group is, of course, too small to permit any definite conclusions; yet it would seem that positive histamine tests do not accompany high histamine contents in the blood but, rather, low ones. I hope to elucidate these conditions in the continued investigation.

We also compared the 27 positive skin tests with special reference to the blood histamine, and found there a mean value of 0.0261 ± 0.0029 γ per milliliter. If, like Randolph, we regard a blood histamine content of over 0.071 γ as positive, i. e., pathologic, then only three of our cases of Ménière's disease will be assignable to that category. We had one patient who showed a positive skin reaction and a blood

histamine value of 0.0840 γ, and one with a negative reaction and a value of 0.1080 γ per milliliter.

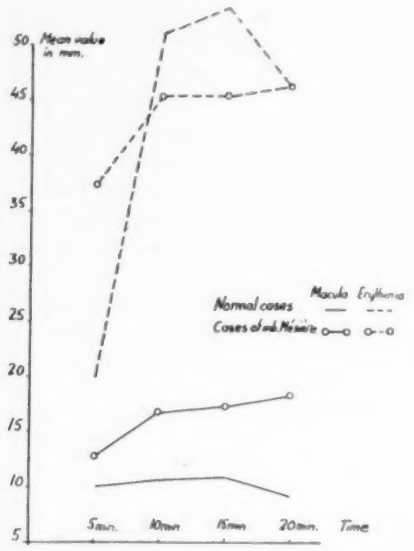

Fig. 2.—Mean value in histamine skin test in normal cases and in Ménière's disease.

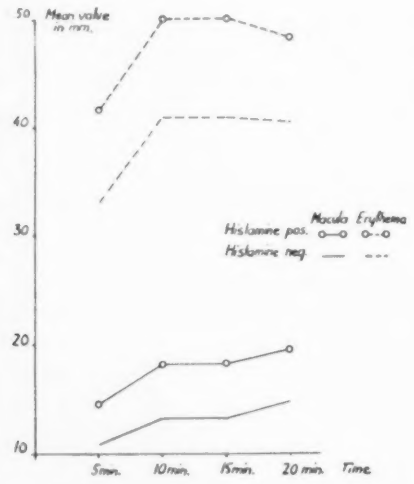

Fig. 3.—Histamine-positive and histamine-negative reactions in Ménière's disease.

A similar tabulation of the 26 negative cases shows a blood histamine value of 0.0305 ± 0.0135 γ, and in the 19 with pseudopods the value is 0.02896 ± 0.0035 γ.

In the 27 cases with positive reactions the mean value for the macula and erythema was well within the range specified by Atkinson as positive, so far as

the area of the macula was concerned; but these cases included only a few with pseudopods (Fig. 3 and Table 4). Figure 3 clearly shows the difference in histamine-positive and histamine-negative reactions in the vertigo patients.

We have treated only a few patients with histamine, and in these have observed no definite effect. One patient was a 50-year-old woman who showed a blood histamine content of 0.0105 γ per milliliter and a positive histamine skin test. It is worthy of note that in this patient the histamine reactions were just as strongly positive after the histamine treatment as before. In another patient, who had no histamine in the blood and a negative skin test, the histamine treatment complemented previous conservative treatment. In neither case was there any definite effect. Nor did we observe any demonstrable effect of treatment with antihistaminics. I hope to publish more in this connection in a subsequent paper.

TABLE 4.—*Difference between Positive and Negative Reactions to Histamine*

	Positive Reactions			
	Diameter of Macula in Mm.		Diameter of Erythema in M:n.	
Reading After	Range	$M \pm \Sigma (M)$	Range	$M \pm \Sigma (M)$
5 min.	6-25	14.8 ± 0.90	0-100	41.6 ± 5.53
10 min.	9-25	18.2 ± 0.80	0- 90	50.1 ± 4.56
15 min.	13-30	18.4 ± 1.20	30- 80	50.2 ± 4.53
20 min.	15-40	19.7 ± 1.40	35- 75	48.4 ± 3.68
	Negative Reactions			
	Diameter of Macula in Mm.		Diameter of Erythema in M:n.	
Reading After	Range	$M \pm \Sigma (M)$	Range	$M \pm \Sigma (M)$
5 min.	7-15	10.9 ± 0.45	0-50	33.2 ± 3.58
10 min.	8-20	13.2 ± 0.48	0-50	40.9 ± 1.17
15 min.	8-17	13.1 ± 0.47	0-50	40.9 ± 1.26
20 min.	12-18	14.5 ± 0.71	0-50	40.5 ± 3.78

SUMMARY

The present investigation comprises 53 cases of Ménière's disease which were studied with reference to histamine as an etiologic factor and in treatment. Histamine skin tests showed positive reactions according to Atkinson's criteria in about 15% of the vertigo cases.

The mean blood-histamine value was not higher in vertigo patients than in normal persons and otosclerosis patients; rather, the values were somewhat lower, and lowest in those presenting positive histamine reactions.

Only a few persons have yet been treated with histamine, and no definite conclusions can be drawn from the results up to the present time. On the whole, the effect seems to be meager, so far as can now be judged. However, histamine appears to play some part in Ménière's disease, and it is hoped that further investigation and research will serve to elucidate this question.

This discussion and the results of studies of histamine in Ménière's disease are presented in order to elicit opinions and suggestions for further research on this problem.

Ringvägen 64ᵛ.

TREATMENT OF OTITIS MEDIA CAUSED BY PSEUDOMONAS AERUGINOSA IN INFANTS WITH NEOMYCIN

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AND
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MUCH has been written about otitis media in children, but very little about it in infants. In the light of the newer concepts of antibiotic therapy, it is felt that diseases of the middle ear in infants require newer evaluation, newer clinical concepts, and different treatment. In the past, clinical attention in the search for a diagnosis in infants who showed marked irritability, sleeplessness, diarrhea, poor appetite, and increases in temperature from 100 to 101 F. was directed to the gastrointestinal tract for the cause. Although it is known that middle ear infections can be the forerunner of gastrointestinal symptoms, the infants' ears were not examined thoroughly until they began to discharge spontaneously, after which the aforementioned symptoms were relieved. Other infants and children with suppurative otitis media were treated with antibiotics and sulfonamides without myringotomy. This resulted in a return to normal temperature and an absence of clinical complaints, but the drum membranes showed little or slow resolution, being red and slightly swollen, with or without normal landmarks, for weeks afterwards. In some of these cases, chemotherapy appeared to mask the lesion of the middle ear. In this type of case, myringotomy and the addition of 2,500 units of neomycin, given intramuscularly every three to four hours for three to four days, caused complete resolution, with a negative culture for Pseudomonas aeruginosa from the nose and pharynx at the time of the patient's discharge from the hospital.

These infections in infants, particularly the intractable ones that were mixed bacterial infections resistant to the existing antibiotics and chemotherapeutic agents, attracted our attention and challenged our otological ingenuity.

ANATOMY

In older infants, above the age of 6 months, and in children the external canal is large enough so that the tympanum is easily visualized. In these patients the cause of the symptoms is easily ascertainable and is ordinarily associated with acute

Aided by a grant and a supply of neomycin by the Commercial Solvents Corporation, Terre Haute, Indiana.

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otitis media. However, in infants under 6 months of age, in whom the ear canal is very narrow and the drum is still parallel with the posterior superior external canal wall, the tympanum is not easily visualized, being often mistaken for a red canal wall, and the otitis is easily overlooked.

The infant's external ear canal is slit-like and appears collapsed, thereby making the examination of the tympanum difficult. The membrane is about 8 by 9 mm. in size and is attached within the notch of Rivinus. The membrane in infants is thick and elastic, requiring more intratympanic pressure to rupture spontaneously. Therefore, continued purulent material could cause symptoms (irritability, sleeplessness, diarrhea, etc.) long before spontaneous rupture occurs. The middle ear is almost slit-like with an underdeveloped hypotympanum, and the epitympanum is in direct contact with the middle fossa through an open petrosquamosal suture, allowing direct flow of blood and lymph into the dura. Therefore, the direct extension of irritation or infection of the dura could account for some of the convulsions, irritability, and gastrointestinal symptoms. The wide-mouthed Eustachian tube lies parallel with the nasopharyngeal wall, making this canal a direct and easy approach to infection.

BACTERIOLOGY

In the preliminary report on the treatment of otitis media with neomycin,[1] special attention was not given to Pseudomonas aeruginosa (Bacillus pyocyaneus) as the specific offending organism. Excellent results were generally obtained in infants and children with the standard antibiotics except in cases in which the ear continued to drain. In these cases, Pseudomonas aeruginosa was usually isolated and successful healing was troublesome.

Derham[2] reported on 268 infants with acute suppurative otitis media treated with penicillin and/or sulfonamides with appallingly poor results and a mortality rate of 38%. Many of the children had an associated parenteral infection. Derham did not state the type of bacteria involved, but it is probable that his poor results with penicillin and sulfonamides were due to the fact that he may have been dealing with Pseudomonas or Proteus infections. Carithers[3] reported on five cases of otitis media in infants all under 20 weeks of age who were treated with penicillin and sulfonamides without results. He claimed that when the patients were treated with streptomycin recovery took place within 4 to 10 days, but he did not credit this result totally to the streptomycin.

Pseudomonas aeruginosa is ordinarily considered an organism of low invasive power and virulence, but in recent years it has become apparent that serious infections caused by it are becoming more and more frequent. It is probable that the refractoriness of this organism to antibiotics is responsible for the apparent increase in invasiveness. Numerous entities have been caused by the organism, such as

1. Lazar, A., and Fishman, J.: Neomycin in the Treatment of Otitis Media in Infants, Eye, Ear, Nose & Throat Month. **29**:484, 1950.

2. Derham, R.: Otitis Media in Infancy, Brit. M. J. **1**:835, 1948.

3. Carithers, H. A.: Otitis Media in Infancy: Treatment with Streptomycin: Report of 5 Cases Caused by P. Aeruginosa, J. Pediat. **36**:767, 1950.

diarrhea,[4] stomatitis,[5] meningitis,[6] and endocarditis.[7] Stanley [8] reviewed this problem in 1947.

Pseudomonas aeruginosa is often found on normal skin, particularly in the anorectal and axillary areas. It can be a normal resident of the external ear canal and under favorable conditions, such as slight irritation or trauma, can cause otitis externa, followed by furunculosis. It may be transferred autogenously or by nurses to infants. In several infants in this series, Pseudomonas aeruginosa was isolated from the umbilical cord. It may also cause infection in the upper respiratory tract from the vaginal tract during birth. Turner [9] has isolated Pseudomonas aeruginosa repeatedly from the vaginal tract of pregnant women prior to delivery.

This organism is resistant to the commonly used chemotherapeutic agents such as sulfonamides, penicillin, streptomycin, aureomycin, terramycin, chloramphenicol, and bacitracin. Spink and Yow [10] found aureomycin, terramycin, and chloramphenicol ineffective against infections caused by it. Schoenbach, Bryer, and Long,[11] Hayes and Yow,[12] Wallerstein and Schoenbach,[13] and Tombin [14] have used polymyxin intramuscularly in a variety of Pseudomonas infections, with some success. The drug, however, displays such an alarming incidence of serious nephrotoxic and neurotoxic reactions that its therapeutic effectiveness, when given parenterally, is likely to be limited.[15]

Neomycin is an antibiotic, first reported on by Waksman and LeChevalier in 1949.[16] Waisbren and Spink [17] found it to be effective, in vitro, against a majority of strains of Pseudomonas aeruginosa, as did Waksman, Katz, and LeChevalier.[18]

4. Shaffer, A. J., and Oppenheimer, E. H.: Pseudomonas (Pyocyaneus) Infection of the Gastro-Intestinal Tract in Infants and Children, South. M. J. **41**:460, 1948.

5. Marsh, H. F.; Strenge, H. B., and Stein, J. M.: An Unusual Stain of Pseudomonas Aeruginosa, Am. J. Dis. Child. **78**:252, 1949.

6. Evans, F.: Primary Meningitis Caused by Pseudomonas Aeruginosa, M. Rec. **144**:111, 1936.

7. Moragues, V., and Anderson, W. A. D.: Endocarditis Due to Pseudomonas Aeruginosa, Ann. Int. Med. **19**:146, 1943.

8. Stanley, M. M.: Pyocyaneus Infections: A Review, Am. J. Med. **2**:253-347, 1947.

9. Turner, S. J.: Effect of Penicillin Vaginal Suppositories on Morbidity in Vaginal Hysterectomy and on the Vaginal Flora, Am. J. Obst. & Gynec. **60**:806, 1950.

10. Spink, W. W., and Yow, E. H.: Aureomycin: Present Status in the Treatment of Human Infections, J. A. M. A. **141**:964 (Dec. 3) 1949.

11. Schoenbach, E. B.; Bryer, M. S., and Long, P. H.: Clinical Use of Polymyxin, Ann. New York Acad. Sc. **51**:981, 1949.

12. Hayes, E. R., and Yow, E. M.: Meningitis Due to P. Aeruginosa Treated with Polymyxin B., Am. J. M. Sc. **220**:633, 1950.

13. Wallerstein, R. S., and Schoenbach, E. B.: Polymyxin Effective in the Treatment of Pyocyaneus Sepsis: Report of a Case, J. Mt. Sinai Hosp. **16**:190, 1949.

14. Tombin, C. E.: Pseudomonas Meningitis: Report of a Case with Recovery after Polymyxin B. Therapy, A. M. A. Arch. Int. Med. **87**:863 (June) 1951.

15. Stanley, P. G.: The Polymyxins: A Review and Assessment, Am. J. Med. **7**:807, 1949.

16. Waksman, S. A., and LeChevalier, H.: Neomycin: A New Antibiotic Active Against Streptomycin-Resistant Bacteria, Including TB Organisms, Science **109**:305, 1949.

17. Waisbren, B. A., and Spink, W. W.: Comparative Action of Aureomycin, Chloromycetin, Neomycin, Q 19, and Polymyxin B. Against Gram-Negative Bacilli, Proc. Soc. Exper. Biol. & Med. **74**:35, 1950.

18. Waksman, S. A.; Katz, E., and LeChevalier, H.: Antimicrobial Properties of Neomycin, J. Lab. & Clin. Med. **36**:93, 1950.

A large series of strains of Pseudomonas aeruginosa studied in this laboratory showed that the minimal inhibitory concentrations ranged from 0.2 to 50 units per cubic centimeter, with a mean of 2.3 units. Clancy [19] studied the sensitivities of 35 freshly isolated strains to neomycin and found them to range from 2 to 50 units per centimeter.

Neomycin has as yet not been widely used clinically because of its reputed neurotoxicity and nephrotoxicity when given parenterally in high doses. Waisbren and Spink [20] reported beneficial effects in Pseudomonas and Proteus infections. Ditkowsky, Goldman, and Goldin [21] successfully treated Pseudomonas meningitis with intramuscular administration of neomycin.

Lazar and Fishman [1] found neomycin to produce striking clinical improvement in infants, particularly those with infections caused by sensitive strains of Pseudomonas aeruginosa. Wooldridge and Hoffman [22] demonstrated that neomycin contained an active fungicidal principle. Observations here confirmed the fact that neomycin appears to be effective against the otomycoses as well as bacterial ear infections in adults and children. Kile, Welsh, and McAfee [23] reported that neomycin gave therapeutic results superior to those of any preparation previously used in the treatment of pyogenic skin infections. We have used a similar ointment in a concentration of 5 mg. to 1 gm. of vehicle in chronic cases of itching and in most eczematoid conditions of the external canal, with excellent results.

Cultures were taken from the patients, and organisms were identified by the usual bacteriologic techniques. In vitro tests for sensitivity to neomycin were done by the standard broth dilution method using penassay broth as the substrate and 48 hours as the reading time. It was noted that at 24 hours there was considerable evidence of bacteriostasis, i. e., several tubes showed no apparent growth but after 24 hours more incubation revealed heavy growth. This is similar to the findings of Clancy.[19] Results of these sensitivity tests are given in Table 1. A study of the pattern of the development, in vitro, of resistance to neomycin has been completed and will be reported elsewhere.[24] It was found that resistance to neomycin could be induced only with difficulty and to a low degree. The resistant variants displayed a stepwise "penicillin type" of resistance rather than the rapid "streptomycin type." There was no cross resistance to streptomycin. These studies lead to the conclusion that the in vivo appearance of resistant variants, which is such a problem during streptomycin therapy, should not be a disadvantage during neomycin treatment.

Cultures were taken from the ears, nose, and throat of 44 infants after birth; from 11 of these Pseudomonas aeruginosa was isolated. Many of the infants appeared to have an active upper respiratory infection 4 to 12 hours after birth. At

19. Clancy, C.: The Sensitivity of Freshly Isolated Bacteria to Neomycin, J. Bact. **61**:715, 1951.

20. Waisbren, B. A., and Spink, W. W.: A Clinical Appraisal of Neomycin, Ann. Int. Med. **33**:1099, 1950.

21. Ditkowsky, S.; Goldman, A., and Goldin, M.: Pseudomonas Meningitis in an Infant Successfully Treated with Neomycin, Pediatrics, to be published.

22. Wooldridge, W. R., and Hoffman, M.: A New Antifungal Principle Produced by Streptomyces Fradiae, J. Invest. Dermat. **15**:351, 1950.

23. Kile, R. L.; Welsh, A., and McAfee, G. D.: Topical Use of Neomycin: Preliminary Report, Arch. Dermat. & Syph. **62**:911 (Dec.) 1950.

24. Goldin, M., and Auerbach, H.: Induced Resistance of Pseudomonas Aeruginosa to Neomycin, to be published.

this time, they were found to have considerable mucoid secretion in the nose and a highly inflamed mucosa. Several of them had frank upper respiratory infection,

TABLE 1.—*Sensitivity of Strains of Pseudomonas Aeruginosa to Neomycin*

Minimal Inhibitory Concentrations of Neomycin	No. of Strains
0.2 - 0.4	3
0.8 - 1.6	9
3.12- 6.25	11
12.5 -25	2
>25	1
	26

TABLE 2.—*Cultures from Patients with Otitis Media*

	No. of Cases	No. Positive for Pseudomonas Aeruginosa	%
Babies	44	11	25
Children	83	7	8.7
Adults	89	12	13.5
Totals	216	30	13.8

TABLE 3.—*Other Bacterial Flora from Ears of Patients with Otitis*

	Babies, 39 Cases*	Children, 99 Cases*	Adults, 81 Cases*
Hemolytic Staphylococcus aureus	11	23	22
Nonhemolytic Staph. aureus	9	9	16
Staphylococcus albus	7	5	14
Staphylococcus citreus	1	..	1
Alpha streptococcus	5	3	..
Beta streptococcus	5	4	1
Nonhemolytic streptococcus	..	..	2
Enterococcus	..	2	3
Pneumococcus	4	7	2
Diphtheroids	2	8	16
Micrococcus tetragenus	5	3	2
Bacillus subtilis	1	5	2
Neisseria sicca	1	..	..
Neisseria catarrhalis	1	..	1
Escherichia coli	2	1	3
Aerobacter aerogenes	2	..	8
Proteus vulgaris	..	..	6
Proteus mirabilis	..	..	4
Proteus rettgeri	..	..	1
Proteus morganii	..	..	1
Paracolobactrum intermedium	..	..	1
Achromobacter	..	..	2
Candida sp.	1	..	1

* Some of these are repeat cases.

middle ear infection, and drainage within 24 to 48 hours after birth. They required myringotomy and drainage together with neomycin, 2,500 units intramuscularly every four hours. Subsequent healing took place in these cases. Cultures were also made of material from 83 children with upper respiratory and middle ear infections

and from 89 adults with chronic suppurative otitis media (Table 2); of these, 7 children and 12 adults were found to have infections of the Pseudomonas aeruginosa variety. Other bacterial flora isolated in these cases is listed in Table 3.

CASE REPORTS

Rather than cite all cases of Pseudomonas aeruginosa infection treated in infants and children, we are selecting a few illustrative cases in which treatment with neomycin was given.

CASE 1.—B. R., examined approximately four hours after birth, had mucoid material in the nose. The pharynx and both ear drums were red. Since it was suspected that the mucoid material in the nose might represent an active infection, it was cultured, and Pseudomonas aeruginosa was isolated. The infant was afebrile but did not feed well, had slight diarrhea, and was irritable. On Dec. 26, 1950, mother and infant were discharged from the obstetric department of the hospital. On December 31 the child was readmitted into the pediatric clinic with an upper respiratory infection. The temperature was 101.4 F. rectally, and the infant was irritable and feeding poorly. Examination revealed an aggravated redness of the pharynx and ears.

Myringotomy was done on both ears, and bluish-greenish discharge was obtained from which Pseudomonas aeruginosa was grown. Neomycin was given, 1,500 units intramuscularly every four hours and ear drops, 200 units per cubic centimeter, three times daily into each ear. On Jan. 1, 1951, the child was completely asymptomatic, and both ears were dry. He was discharged from the hospital and has not been seen since.

CASE 2.—M. L., an infant 5 weeks old, was admitted to the hospital on Nov. 2, 1950, irritable, vomiting, and feeding poorly and with no gain in weight for the past 10 days. The child was examined several hours after birth and was found to have a red pharynx, mucoid secretions, and a highly inflamed nose. On admission to the hospital, there was a slight discharge from the right ear, associated with bilateral cervical adenopathy. The right ear drum was red and bulging, with a small perforation in the attic from which pus was aspirated. The pus was found to contain Pseudomonas aeruginosa. During the acute illness at home, the child had been treated with aureomycin and penicillin without any results.

On Nov. 3, 1950, administration of neomycin was instituted, 2,500 units intramuscularly every three hours and two drops, 200 units per cubic centimeter, in the right ear every three hours. The discharge in the right ear had ceased completely by Nov. 5, the ear drum indicating resolution. The child began to eat and rest well and was discharged from the hospital on Nov. 7, 1950.

CASE 3.—A. G., an infant 12 days old, was admitted to the pediatric department on Sept. 19, 1950, with a history of spontaneous delivery at full term. On September 16 he had had projectile vomiting, diarrhea, fever, and a running nose. Examination at this time revealed marked nasopharyngitis, injected ear drums, suboccipital adenopathy, and no rigidity of the neck. The diagnosis at the pediatric clinic was "acute pharyngitis and auto-diarrhea." On September 16 and 17 the child was given penicillin intramuscularly, which was followed by a violent reaction in the form of vomiting and irritability. On September 19 he was admitted to the hospital pediatric division with severe pharyngitis, diarrhea, anorexia, and a palpable spleen. He was also markedly dehydrated. Routine culture of the nose and pharynx showed diphtheroid bacilli and hemolytic streptococci.

The child was given aureomycin and terramycin at intervals without beneficial effect. On September 22 the right ear abscess ruptured spontaneously, with a yellowish discharge. Culture of the discharge showed Pseudomonas aeruginosa. The infant was then given neomycin, 1,500 units every four hours intramuscularly, and 200 units per cubic centimeter locally in the form of ear drops. After the first 24 hours, he showed marked improvement and was feeding better. The right ear was completely dry on the third day after the spontaneous rupture. On Oct. 1, 1950, culture from the right ear was negative for Pseudomonas aeruginosa.

CASE 4.—T. S., a child 16 months of age, was admitted to the hospital on Sept. 10, 1950, with a persistent skin rash for eight months. He had lost weight and was eating poorly. There

was no history of exposure to any disease. Physical examination revealed a well-developed, somewhat undernourished child. The pulse was 120 and the temperature 102.4 F. rectally; there was a diffuse maculopapular eruption on the chest. A small ulcer was noted in the right axilla. On September 13, the right ear and the throat were noted to be bleeding. Cultures at this time showed Pseudomonas aeruginosa in the axillary lesion and in the pharynx.

The child was treated with aureomycin, without results. On September 15 therapy was changed to neomycin applied locally to the axillary ulcer in solution in the form of packs and given intramuscularly, 2,500 units every 24 hours. At this time a pneumonic process was found. On the third day of neomycin treatment, the temperature fell to normal and remained so. A repeat culture on September 22 proved negative. The axillary ulcer cleared and generally improved so that the child was discharged from the hospital on September 23.

He was readmitted on October 6 with intermittent fever, dyspnea, and extreme irritability. Physical examination at this time revealed a toxic, semistuporous child with acute respiratory distress even while in oxygen. The pulse was 130 and the respiratory rate 68. The maculopapular eruption on the skin was still present. Fluid and blood were given intravenously and neomycin, 2,500 units intramuscularly every three hours. The following day the temperature was normal, the color had improved, respirations were normal, and the chest findings were minimal. On October 9 the ears (from which Pseudomonas aeruginosa had been isolated) were markedly improved, but there were rales in the chest. By October 13 administration of neomycin had been stopped because of the improvement. On October 19 the child showed an amazing improvement; there was no respiratory distress, and ear drainage was completely absent. On October 30 he was walking. On November 1 he again had a temperature of 102 F. rectally, with rhonchi and rales in the chest. On November 8 bronchial material aspirated through the bronchoscope was cultured and was positive for Pseudomonas aeruginosa. Again on November 13, culture from the right axillary lesion showed no growth. The bronchial aspirations proved that we were dealing wtih a case of Pseudomonas pneumonitis. By November 26, all cultures for Pseudomonas aeruginosa were negative, but after this date the child started a rapid downhill course, and he died on Dec. 17, 1950, with a diagnosis of Letterer-Siwe disease.

SUMMARY

The problem of the treatment of Pseudomonas infections and otitis in infants was encountered. As a coincidental part of this work, Pseudomonas aeruginosa infections of the urinary tract, lungs, and skin were also successfully treated with neomycin. No untoward reactions were encountered in infants, children, or adults with the dosages used. Gratifying results were also obtained in adults with chronic suppurative otitis media, in some cases of as long as 40 years' duration. Three to four drops of neomycin in the affected ear every three hours, with 200 units per cubic centimeter of isotonic sodium chloride solution, cleared up these infections and the hearing improved remarkably.

CONCLUSION

Neomycin administered either locally or intramuscularly appears to be highly effective in otitis media and other infections in infants and children caused by Pseudomonas aeruginosa. No untoward effects from the antibiotic were noted with the dosages used in this series.

JAMES LAWRENCE LITTLE, A FORGOTTEN PIONEER

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IN THE *Hospital Gazette* in 1879, there appeared an article entitled "A Hitherto Undescribed Lesion As a Cause of Epitaxis with Four Cases," by James L. Little, M.D., "New York Professor of Surgery, Medical Department of the University of Vermont, Lecturer on Operative Surgery and Surgical Dressings in the College of Physicians and Surgeons, New York City." [1]

This paper is not only the first description of the location in more than 90% of all cases of nose bleeding, but it is the best ever written on the subject. Here is a great physician, with a talent for the clear, direct phrase, speaking to us across the years in simple, unadorned language.

Little describes in detail four cases of nose bleeding and then goes on to discuss the core of the matter:

> The seat of the ulcer seemed to be in or about the same situation on the septum in all the cases, about half an inch from the lower edge of the middle of the columna. The septum at this point is supplied with branches of the anterior ethmoidal arteries which anastomose freely with branches of the sphenopalatine artery. The lower portion of the septum is supplied by a branch of the superior coronary—the artery of the septum.
>
> This cause of hemorrhage is not mentioned by any of the writers that I have consulted, and I believe that many cases of epistaxis occur from this part of the nasal cavity, which are overlooked.
>
> The practical point derived is, that it is advisable to carefully inspect the anterior nares and especially the septum nasi in all cases of epistaxis, before plugging either the anterior or posterior nares. If the hemorrhage comes from the septum it can readily be controlled by touching the bleeding point with nitrate of silver, or with styptic cotton, or with the persulphate of iron; and if these should fail the spot may be easily reached with a hot needle. Compression by plugging the anterior nares did not seem to do permanent good in the four cases related above.
>
> In all the cases, the epistaxis occurred in patients who seemed to be in good health and had never suffered in this way before. No syphilitic taint existed in any of the cases. The recurrence of the attacks at short intervals is one of the distinctive features of epistaxis arising from this cause.

It is only natural that those of us who have written or lectured on nose bleeding should feel somewhat embarrassed after reading Little's account, because unknowingly we have been quoting him almost word for word and at the same time giving Kiesselbach, the German laryngologist, credit for the discovery of the principal area of nose bleeding.

Kiesselbach, in 1880, reported three cases of nose bleeding which originated from distended blood vessels on the inferior border of the septum of the anterior nares. However, it seems that Kiesselbach believed his principal work on nose

1. Little, J. L.: A Hitherto Undescribed Lesion as a Cause of Epistaxis, with 4 Cases, Hosp. Gaz. **6**:5-6 (March-Dec.) 1879.

bleeding to be his paper published in 1884.[2] In this paper he gave just one sentence to Little. He said, "Little found in four cases erosions of the nasal septum just behind the entrance of the nose." There was no reference to the fact that Little published his paper in 1879 and no comment on Little's brilliant description of the bleeding area. Kiesselbach quoted Hartman to confirm his own work. From this is evident that both Kiesselbach and Hartman were aware of Little's paper of 1879. Hartman analyzed 12 cases of nose bleeding: Little's 4 cases, Michel's 2, Voltoline's 1, and 5 of his own. Hartman concluded from the evidence of these 12 cases that in most cases spontaneous nose bleeding came from the anterior part of the nasal cavity, either from the nasal septum or from the floor of the nose.

In his article of 1884, Kiesselbach also reported several new cases of nose bleeding, and his conclusions were that in most cases the source is on the anterior, inferior part of the cartilaginous septum, occasionally on the superior border of the cartilaginous septum, and sometimes, as in two of his cases, at the junction of the septum and the floor of the nose in the region of the foramen incisura.

The conclusions to be drawn from this study are that Little was the first to publish his findings on nose bleeding, that his description of the most frequent locality of the bleeding is vivid and clear, and that the experiences of physicians through the years have confirmed Little's work.

Kiesselbach, whose articles were published after Little's, at no time gave an exact description of the bleeding area as Little did, and his work, viewed from all angles, is decidedly inferior to Little's. Therefore, we should discontinue use of the term locus Kiesselbach and replace it with Little's area.

James Lawrence Little was a famous surgeon far in advance of his time. He served on many staffs of New York hospitals, and he could well be the subject of a great biography.[3] It seems an ironic twist of fate that this man, whose name is not included in many medical dictionaries, should be neglected and almost forgotten in his own country, while his name is remembered in Great Britain by use of the term Little's area.

Let us give this great man his due and use his name, appropriately, to designate the most frequent site of nose bleeding, Little's area.

17 Second St.

Helpful suggestions were received from Dr. O. E. Hallberg, Rochester, Minn.; Dr. Crawford R. Green, Troy, N. Y., and Dr. W. Fedorciw, Troy, N. Y.

2. Kiesselbach, W.: Über spontane Nasenblutungen, Klin. Wchnschr. **21**:375-377, 1884.
3. Burlington Free Press, Burlington, Vt., April 10, 1885, p. 3.

TREATMENT OF ANTRO-ORAL FISTULA WITH PARTICULAR REFERENCE TO USE OF STREPTOKINASE AND STREPTODORNASE

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STREPTOKINASE and streptodornase offer the surgeon a new biologic approach to the therapy of infections. Fibrin and desoxyribose nucleoprotein form substantial parts of the solid increment of thick pus. If thick viscid purulent material could be successfully removed from infected areas, the formation of healthy granulation tissue and consequently healing could be facilitated. Through their catalytic and enzymatic properties, streptokinase and streptodornase produce the hydrolysis of fibrin and desoxyribose nucleoprotein if direct contact can be effected for a sufficient period of time. Thick purulent material is thus made less viscid and therefore more easily aspirated, with the result that infected areas can be cleaned up preparatory to plastic surgery. Clinical experience with these compounds in the treatment of infections has been uniformly good. Streptokinase and streptodornase have wide clinical applications. They will prove useful wherever the surgeon wishes to cleanse the wound of fibrin and desoxyribose nucleoprotein. Their usefulness is not limited to the field of general surgery,[1] as the subsequent report of an instance of a seriously infected antro-oral fistula will show.

Hill [2] states that while the majority of antro-oral fistulas follow dental extractions, they may also result from infection, cysts, tumors of the upper jaw, or trauma or may follow operations on the antrum. Many fistulas heal spontaneously or with a minimum of treatment. The fundamental of treatment is the control of antral infection. The persistence of infection increases the technical difficulties of closure of the antro-oral fistula. The measures usually employed to cleanse the infected antrum are irrigation, use of intranasal vasoconstrictors to promote drainage, and administration of chemotherapeutic and/or antibiotic agents parenterally. Effective intranasal drainage by trocar puncture should be established as soon as possible.

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Reviewed in the Veterans Administration and published with the approval of the Chief Medical Director. The statements and the conclusions published by the authors are the result of their own study and do not necessarily reflect the opinion or policy of the Veterans Administration.

1. Miller, J. M.; Ginsberg, M.; Lipin, R. J., and Long, P. H.: Clinical Experience with Streptokinase and Streptodornase, J. A. M. A. **145**:620-624 (March 3) 1951.

2. Hill, F. T.: Antro-Alveolar Fistulae, Laryngoscope **61**:242-253 (March) 1951.

For large fistulas or those of long duration, it has been necessary in the past to combine the Caldwell-Luc procedure with the plastic operation on the fistula. This may be done separately in two stages or combined in one stage.

The Caldwell-Luc procedure is useful in providing drainage of the infected antrum. If a nonsurgical substitute could be found to cleanse the antrum, the operation could be avoided. If the compounds applied topically in addition would also promote the appearance of healthy granulation tissue, their use would be much more desirable, since the chances of successful plastic closure would be increased considerably.

The advantages attending the use of streptokinase and streptodornase in the treatment of infections—and, in the case in point, an infected antrum—are many. Pus is made less viscous and, therefore, is drained more easily. Phagocytic activity is increased locally. Chemical cleansing of the walls of the abscess permits the chemotherapeutic and/or antibiotic agent being used to reach bacteria that might otherwise be protected from the action of the drugs by a thick covering exudate. The growth of healthy granulation tissue is enhanced.

REPORT OF A CASE

F. H. S., a 38-year-old white man, was admitted to the Veterans Administration Hospital on Feb. 11, 1951, with a left antro-oral fistula, present for about five months. The left upper second molar tooth had been extracted, and the extraction had been followed by an antro-oral fistula and a maxillary sinusitis. Intermittent drainage of malodorous pus from the sinus persisted and was associated with a dull throbbing headache. Prolonged local treatment of the infection given by other physicians before admission was not beneficial.

A profuse malodorous discharge came from the left side of the nose. An antro-oral fistula connected a severely infected left maxillary sinus and the mouth.

Roentgenograms showed clouding of both maxillary sinuses, more marked on the left, and a slight clouding of the left ethmoidal sinus. The remainder of the sinuses were clear. Culture of the purulent material from the left maxillary sinus yielded a viridans Streptococcus, diphtheroids, Neisseria, and a hemolytic Hemophilus.

Recalling the success obtained in the treatment of other infections with streptokinase and streptodornase, the use of the enzymes seemed indicated. Since the compounds are active only on the surface and must be put into immediate contact with the infected area, a short segment of polyethylene tubing of small bore was put into the left antrum through a trocar puncture in the inferior meatus.[3] With the patient placed in the proper position to retain the compounds in the antrum, 75,000 units of streptokinase and 25,000 units of streptodornase was put into the antrum once daily on Feb. 24 and Feb. 25. The same amounts of the compounds were installed twice a day from Feb. 26 through March 4 and from March 6 through March 10. An excellent response was obtained. The patient's headache and sinus tenderness disappeared. The drainage material became much thinner and less in amount. The antro-oral fistula became smaller.

On March 22, the antrum was curetted and a small portion of the alveolus removed with the rongeur. A medial and a lateral flap were developed in the mucosa of the mouth, and the antro-oral fistula was closed by sliding the flaps together. A rubber tube of small bore was inserted into the antrum through the nose.[4]

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3. By Alfred T. Lieberman, M.D., Consultant in Otorhinolaryngology, Veterans Administration, Fort Howard, Md.

4. By C. Parke Scarborough, M.D., Consultant in Plastic Surgery, Veterans Administration, Fort Howard, Md.

Thirty-seven thousand five hundred units of streptokinase and 12,500 units of streptodornase was put into the antrum from March 23 through March 25. The dose of the compounds was reduced to 18,750 units of streptokinase and 6,250 units of streptodornase from March 26.

Three hundred thousand units of crystalline penicillin G procaine in oil was given intramuscularly once daily from March 22 through April 17. This was the only time such treatment was given. The repair of the antro-oral fistula was successful. The patient was discharged from the hospital on April 19.

The patient was seen again on June 19. The previous site of the antro-oral fistula was well healed.

SUMMARY

Streptokinase and streptodornase are valuable adjuncts in the treatment of infections when combined with proper surgical treatment. An instance of their successful use in the treatment of an antro-oral fistula is reported.

SPEECH AUDIOMETRY IN PRACTICAL USE

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THE GREAT practical value of speech audiometry is its usefulness in checking the validity of both air- and bone-conduction pure-tone audiograms in diagnosis. To understand this statement, one must review briefly some of the basic facts underlying the tests. Emphasis will be placed upon concepts of importance to the clinician, whose interest is of necessity less broad than that of a research audiologist, who is a specialist in psychoacoustics. These concepts include (1) the corroborative value of spondee threshold tests in relation to air-conduction pure-tone audiometry, as well as the limitations of spondees; (2) above-threshold phonetically balanced monosyllabic discrimination ("PB" word tests, usually at 100-db. sound-pressure level) in the evaluation of pure-tone bone-conduction curves and "nerve deafness."

Since a well-designed audiometer can be utilized as a high-quality "master" hearing aid, the instrument offers the otologist a simple means of giving patients a factual opinion [1] and scientific assistance in this field. The present-day tendency to let the patient find his own aid, sometimes with the overenthusiastic advice of a hearing-instrument salesman, rests largely upon lack of appreciation of the usefulness of speech testing, especially articulation scores of phonetically balanced (hereafter referred to as PB) words at a high sound-pressure level (hereafter referred to as s. p. l.). Furthermore, it is now possible for every aurist to measure in a free field the shift in the threshold for speech when any type of hearing device is in actual use by the patient. The time required is comparable to that necessary in other routine hearing tests, and the testing is of great comfort and value to the patient in providing his doctor's guidance in what is to him an extremely important problem.

In a symposium on audiology presented before the American Otological Society, Reger [2] placed first in his list of minimal requirements for equipment a speech audiometer. It is a striking fact that today the great majority of otologists have little knowledge of this instrument and fail to see the advantages which it may offer over the spoken and whispered voice tests, which seem so simple and which are always instantly available. Furthermore, there appears to be a somewhat restricted group of aurists, especially outside of large hospital clinics, who have available to them a speech audiometer. These otologists have the opportunity to study the value and the limitations of the spondee and of the phonetically balanced (PB) word lists commonly employed in the tests.

From the Winthrop Foundation of The Massachusetts Eye and Ear Infirmary.

1. Davis, H.: The Articulation Area and the Social Adequacy Index for Hearing, Laryngoscope **58**:761 (Aug.) 1948.

2. Reger, S.: Minimal Requirements of Equipment for Audiological Work, read before the 84th Meeting, American Otological Society, Atlantic City, N. J., May 11, 1951.

I am fortunate in having a speech audiometer designed and constructed by engineers of the Harvard Psychoacoustic Laboratory. An initial sound-pressure output of 130 db. is attenuated suitably to any desired earphone level. The turntable will play all records manufactured today at whatever the required speed. Spondee records comprising the Harvard Auditory Test No. 9 and records of all PB word lists devised by the Harvard group [3] have been obtained from the Central Institute for the Deaf in St. Louis. The zero adjustment for each test is determined by calibrating the sound-pressure level in terms of a 1000-cycle reference tone incorporated in the records.

The instrument is equipped with a microphone and monitoring device for live-voice testing; a loud-speaker for free-field testing, and a calibrated white-noise masking apparatus. The masking principles are similar in speech audiometry to those in pure-tone testing. A discussion of live-voice techniques will be omitted here, despite their flexibility. The precision and uniformity of records make for stability of test-retest results and permit the use of an assistant in making the examinations.

By considering only the use of records sending measured speech sound-pressure levels to earphone outputs, one realizes that the apparatus and the patient can be in the same testing room without inaccuracies resulting. The desirability of a quiet sound-treated room having a noise level of less than 50 db. is the same in speech and pure-tone air-conduction audiometry. A sound-dead room is not necessary. The under-50-db. figure is chosen because up to 30 db. of noise will not affect thresholds, and earphones, if well-fitting, will exclude about 20 db. of noise. The 30 db. plus 20 db. therefore yields a 50-db. noninterfering room noise measurement.

CLINICAL EXPERIENCE

I have utilized practical speech audiometry for many years as a member of the Winthrop Foundation of the Massachusetts Eye and Ear Infirmary. The personally owned speech audiometer described above is now in its second year of office use. Innumerable tests have been done with it and have been so valuable that an improved model of the instrument has been installed at the Massachusetts Eye and Ear Infirmary at my suggestion.

BASIC FACTS USEFUL IN SPEECH AUDIOMETRY

Just what is meant by a "spondee"? This is a two-syllable word having the two syllables equally accented. The Harvard Test No. 9 has been devised by Hudgins and associates [4] by means of lists of such words. From a large group of disyllabic words, these authors selected 84 spondees for their phonetic content and arranged two lists of 42 words. The lists were then scrambled in six ways, so that 12 tests resulted. On each record there are 42 words divided into seven equal groups; the sound-pressure level diminishes 4 db. after every six words, and so each record has a range of 24 db. The threshold of intelligibility is reached when the listener is able to repeat correctly 50% of the words presented to his ear.

3. Egan, J. P.: Articulation Testing Methods, Laryngoscope, **58**:955 (Sept.) 1948.

4. Hudgins, C. V.; Hawkins, J. E.; Karlin, J. E., and Stevens, S. S.: Development of Recorded Auditory Tests for Measuring Hearing Loss of Speech, Laryngoscope **57**:57 (Jan.) 1947.

The last sentence needs clarification of the terms "intelligibility," "threshold," and the "50%" requirement.

INTELLIGIBILITY

Intelligibility may be defined as the ability of the listener to repeat correctly the speech material presented to his ear. This may be discourse, sentences, phrases, words, or "nonsense" syllables. Here let us consider only English words, out of context with other words.

The longer a word, the more "cues" a listener has in trying to repeat it. It is a curious, interesting, and extremely important fact that the two-syllable spondees constitute an "easy" speech test for the patient, and can be repeated, if given sufficient amplification, by patients with middle-ear or nerve deafness or by those having combinations of these lesions if there remains any practical hearing at 500, 1000, and 2000 cycles on the pure-tone air-conduction audiogram.

The one-syllable PB words have a more difficult intelligibility because they consist of relatively intense lower-frequency vowel sounds and much weaker high-frequency consonants. The short, carefully selected phonetic content limits the listener's cues in such a manner that discrimination is largely dependent upon the ability to hear weak consonant sounds. In patients who have a middle-ear type of deafness, a high percentage of PB words will be repeated correctly when adequate sound-pressure levels are employed. But in patients with cochlear end-organ deafness, the intelligibility of PB words will be sharply depressed, no matter how high the sound-pressure level used to present the material to the ear.

The concept of above-threshold PB word tests provides valuable assistance in determining the validity of bone-conduction curves in relation to cochlear function. The articulation score is found in per cent of correct responses at any sound-pressure level, no matter how high this physical intensity may be. The usual test is carried out at 100-db. sound-pressure level (s. p. l.), re 0.002 dynes/cm^2. In conductive deafness, a high sound-pressure level will overcome any impedance set up by disease in the middle ear, and a score of above 80%, and more frequently above 90%, will be obtained. In testing 50 normal ears (of 25 patients) twice, with an interval of three months between, I obtained an average measurement of 82% on the first examination and 91% on the second. In conduction deafness, the PB score at 100-db. s. p. l. (higher if desired) approximates that of normal subjects.

In patients with cochlear damage, the score falls presumably approximately in proportion to the degree of damage, no matter how high the s. p. l. A response repeated several times of 40 or 50% would indicate serious cochlear disease. On the other hand, a score of 80% or higher would mean that a poor bone-conduction curve could be disregarded. Sometimes the initial PB score will be low, e. g., 40%, and in later tests rise to a much higher level (as when the patient fears earphones). If errors in the testing techniques are carefully excluded, as in pure-tone audiometry, the best scores indicate the patient's real status.

Further examination leads to these conclusions: If there is cochlear pathology, recruitment should be present; this does not aid speech intelligibility. If the cochlea is normal but pathology exists in the nerve pathway, the PB score may be high and no recruitment can be measured.

THRESHOLD

The threshold of speech intelligibility is commonly determined by the use of spondees or, more specifically, by the Harvard Auditory Test No. 9. It is measured in decibels. It has already been defined as the sound-pressure level at which the listener repeats 50% of the test list. This threshold can be predicted from a pure-tone air-conduction audiogram by averaging the response levels for 500, 1000, and 2000 cycles.

THE 50% REQUIREMENT

Otologists sometimes wonder about this 50% requirement. Why not 88%, for example? One group known to me formerly demanded the latter figure of intelligibility for a miscellaneous word list used prior to fenestration, at hearing levels which might be attained postoperatively. This involves a fallacy of measurement so far as spondees are concerned.

Hudgins and associates [4] have found that in normal ears 50% of spondee words will be repeated at a sound-pressure level of about 23 db. On the average, a shift of 6 db. above this level to 29 db. will yield nearly a 100% response; a diminution to 17 db. will yield nearly a 0% response. That is, there is about a 10% rise or fall per decibel. When the upper end of the response curve is reached, no further increase can be measured, since there will be perfect or nearly perfect intelligibility. A high-level percentage requirement does not place the threshold at the midpoint of the steepest part of the response curve—i. e., on the most sensitive area. But a 50% response point does this.

In other words, with spondee audiometry, the rise from 0 to 100% correct responses for disyllabic words, accented equally on the two syllables (e. g., railroad, baseball) in a normal person requires a change in sound-pressure level of only 12 db., or roughly, a curve steepness of 10% per decibel. The response curve is flat at the bottom (less than 20% of correct responses) and at the top (80% or more of intelligibility) but very steep between. Such a curve is called an ogive. It is obvious, therefore, that a 50% response is at exactly the middle of the steepest part of the curve and that a small increment or decrement will normally produce either 100% intelligibility or none, as the case may be. But very high correct scores may be inaccurate in measuring a threshold for speech, since the flattest part of the ogive, not the steepest, is being used, and the degree of displacement on the flat part of the curve is uncertain. The 50% response requirement means placing the measurement at its utmost nicety. Therefore, acoustic psychologists insist upon a 50% correct response when using spondees for determining speech thresholds.

PB monosyllables in clinical practice are not ordinarily used at present in threshold determinations for a number of reasons, but chiefly because the response curve is much less steep than for spondees. Incidentally, in normal ears, the 50% response point is about 33 db., or 10 db. above the normal spondee threshold.

LIMITATIONS OF SPONDEE TESTS

It is, of course, possible to measure spondee thresholds by simple trial and error, and without undue difficulty, since each record has a range of 24 db. To save time, one may utilize the 500-, 1000-, and 2000-cycle measurements of the air-conduction audiogram. By averaging the three, one can then add 40 db. of sound-pressure to this figure and proceed with the test. For example, if the three octaves just mentioned were normal and the s. p. l. on the speech audiometer were set at 40 db.,

that patient should repeat correctly about 21 of the 42 words. These are then scored as follows: No change occurs in the s. p. l. for the first six words, which are at the top of the ogive. Subtracting 6 from 42 leaves 36. A drop of 4 db. occurs for every six words thereafter, giving a value of 4/6 db. for every word repeated correctly. If 21 words were so repeated, the value would be 14 (2/3 of 21 equals 14). From this must be subtracted an adjustment for half of the first six words, because the attenuation starts after the first group of six words and these must be equated at 50% to make the scoring correct. Therefore, since 14 minus 2 equals 12, 12 db. is subtracted from the 40 db. s. p. l. utilized for the test, yielding 28 db. as the threshold. The normal threshold being 23 db., the reading represents a hearing loss of 5 db. Hudgins and associates [4] have prepared a reference table which may be utilized without employing any calculations.

The spondee threshold has no advantages over averaging the accurate determination of the 500-, 1000-, and 2000-cycle pure-tone levels of the air-conduction audiogram. The two check with each other to an amazing degree. In my experience, if there is a greater spread than 10 db. between the results of the two methods, an error has been made in one or the other of the tests. This correlation has been widely observed.[5]

Why, then, need one do this test? It is desirable only as a check upon the validity of the air-conduction audiogram, especially of children, and in postoperative fenestration cases. There may be such a wide discrepancy between a child's gross speech intelligibility and the important frequencies of the air-conduction audiogram that a spondee threshold in decibels will aid materially in attaining a correct diagnosis. The speech response will usually be "under" (i. e., will have a higher threshold) an inaccurate pure-tone air audiogram, and there is absolute certainty that the patient hears at least as well as the spondee determination indicates.

In postfenestration hearing, the speech threshold is sometimes slightly more favorable than the pure-tone audiogram would indicate.

THE VALUE OF ABOVE-THRESHOLD PHONETICALLY BALANCED WORD TESTS IN DIAGNOSIS

There are, of course, many one-syllable words in the English language. With laborious effort by acoustic psychologists,[3] lists of such words have been prepared which "spot-check" English speech by being phonetically balanced; that is, each list contains in miniature not only the common sounds of everyday speech but also the proportional representation of such sounds in terms of the commonness of their use. The 20 lists of 50 words are of approximately equal difficulty and familiarity and are imprinted on records obtainable at cost from the Central Institute for the Deaf.

I have found above-threshold PB word tests to be of very great value in checking the validity of bone-conduction hearing measurements, whether by pure-tone audiometry or by tuning-fork measurements.

The basic difficulty of bone-conduction measurements has long been recognized. Historically, the otologist used tuning forks for the determination of bone conduction. He believed that timing the stem of a tuning fork made to vibrate with a

5. Hirsh, I. J.: Clinical Application of Two Harvard Auditory Tests, J. Speech Disorders **12**:151 (June) 1947.

standard blow had quantitative value when placed on the mastoid process; the total decrement was measured in seconds from the starting vibrations until the subject failed to hear the tone. That is, a threshold was determined in seconds. He was sure that the ear being tested was the right ear when the stem of the fork was placed over the right mastoid process and the left when the left mastoid was used. However, confusion resulted occasionally when a patient reported hearing the tuning fork very well in the opposite ear and little or not at all on the side of the test. By using the time of perceived vibration as the sole criterion, it was a simple matter to determine whether bone conduction was "decreased" or "increased" by simply checking the duration of the test with the known "normal" of the particular fork. It was felt that low-frequency forks such as 128 and 256 cps were less accurate than tuning forks around 500 cps, because the patient could "feel" the vibrations of the relatively slow oscillations. The usual masking device (rarely employed in tuning-fork tests) was a Bárány noise apparatus; the examiner paid little attention to the actual sound-pressure level attained by the masking noise.

By long experience with ear disease, the otologist found empirically that in middle ear disease the tuning forks showed "increased" bone conduction, whereas nerve lesions were accompanied by "decreased" bone conduction.

With the advent of pure-tone audiometry, revolutionary changes began to occur. The principal advantage of the audiometer was that a pure tone could be generated at any desired sound-pressure level throughout the range of the human ear and held constantly at any given intensity without decrement. Furthermore, the sound-pressure level could be altered in measurable steps. It was therefore possible to determine the "normal threshold" for air conduction for pure tones in the range of hearing. Although these threshold curves now regarded as "standard" are not entirely satisfactory to acoustic psychologists, they are of infinite value to otologists.

Bone-conduction threshold curves have a very different status. To discuss this subject adequately would require more space than is available here, but some of the salient points can be summarized.

The modern bone-conduction oscillator employed in making measurements is often large and cumbersome, so that it is difficult to apply firmly against the skull a constant tension without discomfort to the patient. The oscillator itself must lie evenly against the skull and not with only partial contact. It must not impinge on the cartilage of the auricle or external canal and artificially produce vibrations of the air in the external meatus. In contrast, the stem of a tuning fork can be easily held against the mastoid with constant pressure at a point where bone conduction seems best. The otologist usually does his own tuning-fork tests but often has a technician do audiometric examinations. She may have little interest in finding an area where the bone-conduction oscillator seems best heard. These factors are easily remediable if there is care in the placement of the bone-conduction oscillator.

However, with the making of the tests, one's difficulties just begin. In air-conduction audiometric-threshold tests, one can measure the variables with a high degree of accuracy. Although much may be learned from empirical experience with bone-conduction curves, there are a large number of uncontrollable and unmeasurable factors which enter into the test. For example, Békésy [6] has found that

6. Békésy, V.: Handbook of Experimental Psychology, New York, John Wiley & Sons, Inc., 1951, p. 1075.

under 200 cps the skull vibrates from side to side; here the various parts of the head have "simple pendulum movements in the same direction." That is, at low frequencies the head will undergo displacements paralleling those of the oscillator, and compression of the skull is small. On the other hand, above about 1500 cps the skull vibrates in several sections and compression of the labyrinth is a very important factor. At about 800 cps one side of the head moves one way and the opposite side the other way in a kind of resonance. Hirsh [7] summarizes the situation by saying that there are at least two basic types of bone conduction: (1) inertia bone conduction and (2) compression bone conduction. He believes that the two probably operate together at all frequencies, but that their relative importance varies widely. The inertia type is functioning largely or almost entirely for responses below 800 cycles, while compression is chiefly accountable for levels above 1600 cps. Both are important factors between 800 and 1600 cycles.

In inertia bone conduction, let us suppose that a 128-cps fork is made to vibrate over the right mastoid. It displaces the skull in a sort of pendulum motion from side to side 128 times per second. Because the stapes and ossicles are loosely applied to the skull and are not actually a part of it, the stapes footplate will follow the skull motions by inertia only; that is, the oval window of the temporal bone will move relative to the footplate of the stapes in one direction or the other, the stapes moving by inertia only. This mechanism therefore will imitate the patterns of air-conducted sound.

It is obvious that the two ears are being stimulated simultaneously and approximately equally by the stem of this tuning fork, because the entire skull is vibrating as described; that is, there is no theoretical sound-pressure "drop through the skull" by the inverse square law of sound propagation which applies to air-conducted sound. (This reasoning has nothing to do with the air-conducted sound generated by the tines of the fork.)

There is a vast difference between the laws of conduction of sound in various media and in the living skull because of the factors of inertia stimulation of the end-organ; in compression stimulation the applicability of the inverse square law has not been clearly determined. Bárány [8] is of the opinion that compression decreases when the bone-conduction oscillator moves away in a horizontal plane from the labyrinth in question.

If one places the stem of a 2048 cps tuning fork on one mastoid, the resulting vibrations of the skull will be largely compressional as described above, with resulting compression stimulation of the cochlear duct due to two factors. 1. The elasticity of the round window is greater than that of the oval window. 2. A fluid reservoir in the vestibule and semicircular canal causes greater displacement of the fluid in the scala vestibuli than in the scala tympani. This is a simple mechanical problem. Expansion stimulation has the converse effect.

Great stress is laid upon bone-conduction audiometric determinations at 500, 1000, and 2000 cycles. From what has just been said, it will be observed that at 2000 cycles the mechanism will be somewhat as just outlined; at 500 cycles inertia bone conduction will largely predominate, while at 1000 cycles inertia and com-

7. Hirsh, I. J.: Audiometry, Chap. 10, Binaural Hearing and Bone Conduction, to be published.

8. Bárány, E.: A Contribution to the Physiology of Bone Conduction, Acta Oto-Laryng., Supp. **26**:1, 1938.

pression factors will both be important. To complicate matters still further, the texture of the skin, the amount of subcutaneous tissue, the cellular structure or lack of structure of the mastoid process, the air volume and pressure of the middle ear and adjacent spaces, favorable and unfavorable local mechanical factors which are unrecognizable by the examiner in relation to bone conductivity, etc., will come into play in attempts to make bone-conduction threshold tests.

When the foregoing and many other variables not discussed are considered, it is not surprising that the supposed bone-conduction "threshold" printed on the usual audiometry score card is unsatisfactory. In my opinion, the Western Electric 2A bone-conduction threshold curve corresponds more nearly to the usual "normal" encountered in otological practice than is the case with the curves of many other audiometers. One reason for this seems to be that its threshold sound-pressure levels are as follows: 64 cps—38 db.: 128 cps—40 db.: 256 cps—50 db.: 512 cps—55 db.: 1024 cps—45 db.: 2048 cps—45 db.: 4096 cps—35 db.: 8192 cps—25 db.

This is in contrast to a flat 40-db. adjustment in sound-pressure level "across the board" seen in certain other "normal" bone conduction curves. For example, with the Maico audiometer, the sound-pressure level adjustment is a flat 40 db. for each octave of the test.

Bárány [8] has expressed the view that a single bone-conduction receiver utilized for determining a wide range of frequency thresholds will vary from less than 5 to about 10 db. at different octaves because of distortion caused by the skin and soft parts, even with the application of plus or minus 50% average pressure firmness. He states that "it is impossible to design a single bone conduction receiver whose loudness is in some measure independent of the condition of the soft tissues when used for a fairly large range of frequencies. It follows that bone conduction tests covering a wide range of frequencies, to be reproducible, must be carried out with the aid of several receivers."

Many authoritative opinions of acoustic psychologists agree with the view that it is impossible with clinical methods used today to measure bone-conduction accurately because of the difficulty in determining the normal or of controlling the complex factors set up when a test is attempted. Nevertheless, otologists find these tests to be of great practical value and of much reassurance when "normal" or above-normal determinations are found in the patient's examination. When "subnormal" results are obtained, much difficulty in interpretation may be encountered, and for this reason other informative measures must be considered.

It is therefore of the highest importance to have a means of checking the validity of any given bone conduction curve. This can be done so far as the cochlea is concerned by means of speech audiometry, with use of above-threshold phonetically balanced word tests. The examination is done at any high level of sound intensity. Usually a sound-pressure level of 100 db. re 0.002 dynes/cm.^{2} is chosen; since the threshold for PB words is normally 33 db., this really means that the test goes 67 db. above threshold.

The principle of the test is simple. In middle-ear disease, there is merely an impedance which can be overcome by adequate amplification of sound. If the impedance is, for example, 40 db., and sufficient sound pressure is thrown in, the patient should hear vowel and consonant sounds equally well, and perfectly or nearly so when the theoretical 100% response level of the PB ogive is reached. In other words, at a sound-pressure level of 100 db. the above-mentioned patient with

40-db. conduction deafness should give a very high percentage of correct response to a PB word list. In actual practice this is what happens; although the tests may vary about 10%, the response curve for middle-ear deafness will lie between 82 and 98%, in my experience. If the patient has cochlear damage, the response may be very much lower; for example, 40% or 50%, and often less. Patients who have real diminution in the ability to hear high-pitched sounds will hear consonants poorly. The intelligibility of the PB tests relies on the ability to hear consonant sounds, and a patient having cochlear deafness will yield a poor PB score no matter how high the sound-pressure level is raised.

It is to be observed that what has been said about the PB results in cochlear deafness does not apply to damage producing high tone loss within the acoustic nerve itself beyond the cochlea, as in acoustic neuromas or brain-stem damage. Here the PB score may be high, but it is possible by recruitment tests to distinguish between cochlear and nerve pathway pathology. Recruitment is said [9] to occur only in cochlear disease.

SPEECH AUDIOMETER AS MASTER HEARING AID

A well-constructed speech audiometer can be utilized as a "master" hearing aid. The amplification curve of the instrument described in the early part of this paper is flat; its frequency range is wide; the maximum acoustic output of 130 db. can be limited as desired to lower levels; conversely, the acoustic gain necessary for maximum articulation scores with spondee (or PB) word lists can be measured; there is freedom from internal noise, etc. Although it is not possible to "tilt" the flat amplification curve slightly upward, as suggested by Davis and colleagues,[10] its value is obvious to the clinician in predicting the probable usefulness of a hearing aid in specific cases. Moreover, a loud-speaker attachment having a high measured sound-pressure level at the diaphragm offers the opportunity to test the patient's articulation score in a free field with and without the hearing aid and to render an accurate opinion regarding the actual efficiency of the aid in practical use by the patient.

SUMMARY

Some of the basic facts necessary for understanding speech audiometry have been outlined. The relationship between the spondee tests and the air-conduction audiograms have been emphasized, together with the limitations of such spondee tests. The spondee threshold, being interchangeable with the average pure-tone audiometric determinations at 500, 1000, and 2000 cycles, can be omitted whenever one does not desire to check up the accuracy of the air-conduction determinations. The usefulness of above-threshold phonetically balanced word tests in relation to bone-conduction audiometric tests has been emphasized. The practical adaptability of the speech audiometer in functioning as a "master" hearing aid is discussed, with the hope that otologists may offer scientific advice regarding any hearing aid in actual use.

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9. Dix, M. R.; Hallpike, C. S., and Hood, J. D.: "Nerve" Deafness: Its Clinical Criteria, Old and New, Proc. Roy. Soc. Med. **42**:527 (July) 1949.

10. Davis, H.; Stevens, S. S.; Nichols, R. H., Jr.; Hudgins, C. V.; Marquis, R. J.; Peterson, G. E., and Ross, D. H.: Hearing Aids, Cambridge, Mass., Harvard University Press, 1947.

A METHOD OF DISTINGUISHING CONDUCTIVE DEAFNESS FROM PERCEPTIVE DEAFNESS

Preliminary Report

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REPORTS have already been made on various methods of distinguishing conductive deafness from perceptive deafness in the hearing test. Especially in recent years, examinations applying Fowler's recruitment phenomenon are being employed for this purpose. In the present article we intend to introduce a new

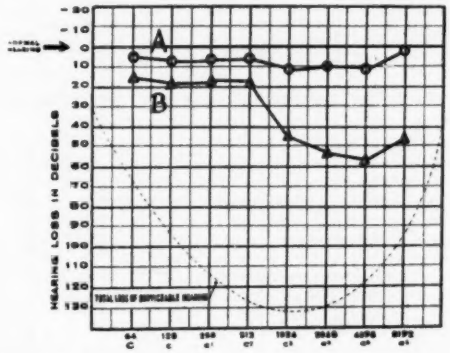

Chart 1.—Mean values of hearing acuity in five normal ears (*A*) before and (*B*) after instillation of glycerin.

method that is altogether different from those that now exist for distinguishing between perceptive and conductive deafness. This method is a very simple one that almost any otologist can easily try in his testing room: First an audiogram of the ear to be tested is recorded, and then the same test is carried out on the same ear after the instillation of 8 drops of glycerin into the canal, care being taken to place the head in such way that the ear is up and the drum membrane can be completely covered with glycerin.

In the case of a normal ear, the test will show the same result as reported by Proetz,[1] i. e., the loss of hearing caused by glycerin instillation is less than 10 db. at frequency ranges of from 64 to 512 cycles per second (cps) but at higher ranges the loss becomes greater—from 45 to 60 db. at 2048 cps or more (Chart 1).

From the Department of Otolaryngology, Shinshu University.

1. Proetz, A. W.: Hearing Acuity Varying with the Position of the Head, Ann. Otol. Rhin. & Laryng. **57**:241 (March) 1948.

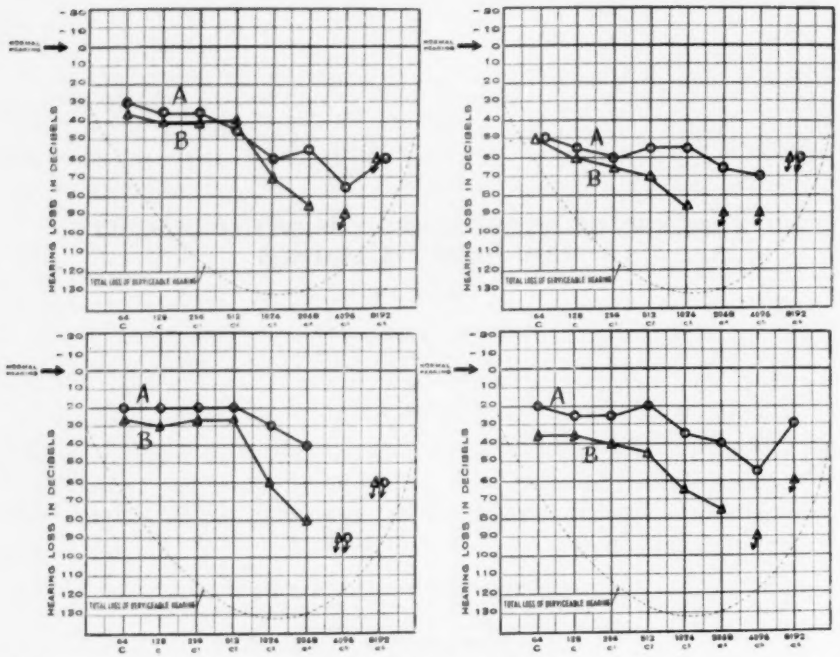

Chart 2.—Audiograms of four patients with perceptive deafness (*A*) before and (*B*) after instillation of glycerin.

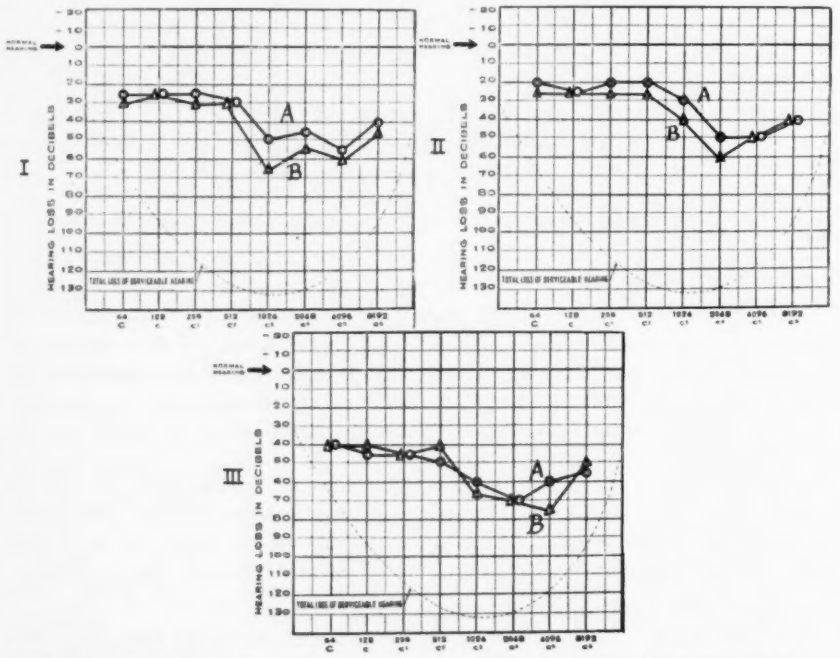

Chart 3.—Audiograms of three patients with conductive deafness without perforation of drum membrane (*I*, I.O., with acute otitis media; *II*, H.S., with catarrhal otitis media; *III*, S.K., with tubal stenosis) (*A*) before and (*B*) after instillation of glycerin.

In the case of perceptive deafness, in which the sound-conduction system of the middle ear is intact, it is easily imagined that loss of hearing is increased by artificial sound-conduction disturbance due to the instilled glycerin, and the difference of the hearing threshold before and after instillation is 30 db. or more at 2048 cps or above (Chart 2).

On the other hand, in many cases of conductive deafness the effect of the instilled glycerin is much less than when the ear is normal or when the patient has perceptive deafness. Even at frequencies of 2048 cps or more, if the loss of hearing is already 45 db. or more prior to instillation of glycerin, the added loss after glycerin has been instilled does not exceed 15 db. (Chart 3).

Of course, when loss before instillation is below 40 db. at those high frequency ranges, the result cannot be ascertained so precisely, and such a loss does not constitute an indication for the test.

More minute examination will have to be made to determine whether or not the result mentioned above can be reached in all cases of conductive deafness. So far we have found that in 20 ears with supposed perceptive deafness the drop of the hearing threshold of all ears was recorded, while in 32 ears with conductive deafness, except in only four cases, the drop in the hearing threshold was not noticed.

SUMMARY

The difference between conductive deafness and perceptive deafness is easily distinguished by testing the hearing acuity prior to and after the instillation of 8 drops of glycerin into the external auditory canal.

UMBO IN SECRETORY OTITIS MEDIA

COMMANDER LEROY E. WIBLE (MC), U. S. N.

IT IS THE purpose of this paper to direct attention to a frequently observed change seen at the umbo in cases of secretory otitis media. Many instances have been encountered in which annoying conductive type hearing losses have persisted for weeks after an apparent subsidence of the physical findings associated with a catarrhal otitis. The Eustachian tube would inflate readily and clearly. The drumhead showed the usual varying degrees of retraction, but one departure from the normal was noted; the spatulated end, so-called, of the handle of the malleus seemed much larger, or the appearance of this area was that of a collection of fluid medial to the dermal layer. The size of this fluid collection varied from 2 to 5 mm. in diameter, the larger ones showing at times a visible fluid level. Perhaps these changes are similar to the cases of Buck as quoted by Keeler [1] in 1930, in which the former describing six cases of cysts of the membrana tympani related: "in one the cyst had apparently formed between the layers of the drumhead," and in another case, "the cyst which was somewhat flattened as though a portion of its contents had been absorbed, arose directly in the center of the drumhead, being nearly three millimeters in diameter."

That there should be some decrease in hearing acuity with these changes at the umbo is understandable. The better sound conduction of a concave surface as compared with a flat one was demonstrated by Hemholz nearly a century ago. Whether changes at the umbo may interfere with the typical absence of a fundamental note peculiar to the membrane itself or whether the dampening effect of the malleous handle arising from the umbilication of the drumhead at the umbo is altered by the collection of fluid here is to be considered.

The finding has obtained in children as well as adults. The history is usually typical of catarrhal otitis media with exudation into the tympanum. Patients with hydrops tympani have been treated in the more or less accepted manner with tubal inflations, attention to the nasopharynx, and myringotomy combined with aspiration through needles or cannula, all of which was followed by the disappearance of the "niveau" and clearing of the tubal inflation tone only to have the patient fail to obtain complete relief from the "plugged" sensation in the ears and egophony. The drumhead would resume its normal luster, color, and position, the only deviation from the normal being the localized area of pearly translucency at the umbo. The picture was frequently bilateral. In some cases as those where no

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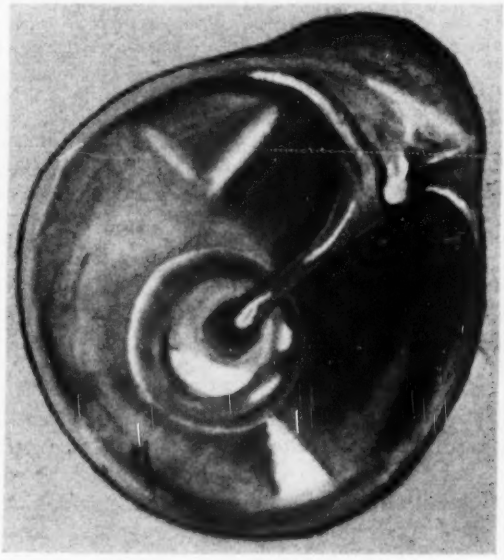
This article has been released for publication by the Division of Publications of the Bureau of Medicine and Surgery of the United States Navy. The opinions and views set forth are those of the authors and are not to be construed as reflecting the policies of the Navy Department.

1. Keeler, J. C.: Modern Otology, Philadelphia, F. A. Davis Company, 1930, p. 231.

fluid level was seen, the application of Bonain's solution (equal parts of cocaine, menthol, and phenol) to the end of the malleus handle brought relief almost immediately. It was concluded that this fixed the fluid as being subdermal-external to the substantia propria. By the simple process of osmosis the fluid was removed. In other cases a small incision was made radially from the end of the handle of the malleus with aspiration of the fluid. In these instances the exudate was believed to be more medial, probably submucosal. It is felt that these collections of exudate do not usually involve the substantia propria but lie either external or medial to this fibrous layer. It is accepted that in due course of time the fluid is absorbed with possibly negligible increase in fibrous components at the umbo.

Because of the prominence of the malleus handle on the medial wall of the tympanic membrane, the cone-like peak of the drumhead medially, and the surface



Loculated collection at umbo with visible fluid level.

tension and viscosity of the mucus in the secretory otitis, the possible adherence of thickening mucus in this area was considered. This potentiality was ruled out by Eustachian inflation after incision (which released the locked fluid), the drumhead ballooning with no escape of air through the wound. The myringotomy has healed in every case with no apparent scar within a few hours to a day or two.

No attempt is made in this paper to assign the histopathologic changes occurring in this finding to varying intratympanic pressures or other factors that may be associated with the modus operandi of secretory otitis media.

CASE REPORTS

CASE 1.—B. G. E., a 5-year-old white boy had a head cold of ten days' duration with onset four weeks before a visit to outpatient ear, nose and throat clinic. The boy's mother stated that she noted the child turning his head to hear with the left ear when he was being addressed and

when he was listening to the radio, since the contraction of his head cold. She knew of no similar complaint previous to this. The boy had never had any discharge from his ears. Otoscopic examination of the right ear showed a localized area of increased translucency at the umbo, circular, and sharply delineated, about 3 mm. in diameter. Application of Bonain's solution on an applicator to the tip of the handle of the malleus was followed by disappearance of the involvement. The patient was seen three days later, at which time his mother stated that he no longer turned to hear with his left ear. The drumhead was normal in appearance.

CASE 2.—J. C., a 56-year-old housewife had a deafness in the left ear of two weeks' duration after an automobile trip overland which included much traveling at high elevations. She said that she had a similar complaint two years previously after a plane trip. At that time the deafness persisted for about two months. From her description of the treatment given, she received what apparently was repeated tubal inflations. The examination upon admission to the outpatient ear, nose and throat clinic showed the left membrana tympani to be intact and in relatively good position with usual luster. However, the umbo presented a 4 mm. circumscribed area of increased translucency with a small line parallel to the deck, apparently a fluid level. A radial incision through this circular area starting at the tip of the malleus handle released a thin serous type of exudate, which was aspirated. At once the patient said that she heard better. The patient upon a return visit four days later presented a normal drumhead. Her hearing was normal.

CASE 3.—F. E. T., a 56-year-old retired naval officer complained of repeated periods of annoying deafness which he described as a "plugged up" sensation in each ear. The periods of complaint varied from seven to ten days and after a moderate amount of relief for a few days would return. There was no pain. He had never had any discharge from the left ear. The right ear had discharged for a two-week period after a severe head cold and swimming in 1936. The right ear upon examination showed an intact drumhead, somewhat atrophic in appearance, with a small healed perforation in the posterior-inferior quadrant. At the umbo a circular well defined area, pearly gray, and somewhat shiny, of 3 mm. diameter was noted. The left ear presented a drumhead with essentially the same findings except for the absence of the healed perforation. Radial incisions into the locked fluid at the umbo on either side were followed by an immediate improvement in the hearing. At his next return visit, one week later, the drumheads were intact and the hearing according to the patient "as good as ever."

COMMENT

The umbo picture described must be seen frequently in every busy otolaryngological clinic. The case histories presented are typical of the many seen. No discussion of this disturbance has been seen in recent literature. Coates [2] feels that because of its frequent occurrence it merits being brought to the attention of those interested in secretory otitis media. Simple incision with release of the locked fluid is easily accomplished after dampening the region with Bonain's solution. Many patients will respond to merely touching the umbo with an applicator wet with this same preparation. This minor procedure has afforded relief in many cases of troublesome recent catarrhal exudative otitis with residual deafness.

CONCLUSION

Persistent deafness after catarrhal otitis should call for careful otoscopy, at which time an enlargement of the so-called spatulated end of the malleus should suggest the possibility of intramembranous exudate.

San Diego 34, Calif.

2. Coates, G. M.: Communication to the author.

Case Reports

CHORDOMA

Discussion with Report of a Case of Cervical Chordoma

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CHORDOMAS are rare tumors found along the spinal column. They occur at both ends, namely in the sacrococcygeal area and the spheno-occipital synchondrosis. However, at times they are found in the cervical, thoracic, and lumbar areas. This is a report of a case of cervical chordoma advancing anteriorly into the pharynx. Chordomas are tumors which arise from remnants of the notochord, the primitive vertebral column. These remnants are present in the body as the soft central core of the intervertebral disks, the nuclei pulposi. They are usually found in older age groups, and the average age is 60 years. They are benign tumors as a rule, yet about 11% are known to metastasize to regional or distant lymph nodes. They are slow-growing tumors and produce their symptoms by infiltrating and destroying the tissues in their paths. The tumors are encapsulated and highly vascular, which gives them their purple-reddish color. The surface resembles cystic formations, but they are not true cysts. However, on cut section they ooze a small amount of mucin. Histologically, they are characterized by Link as "concentric nests of cells and the presence of large physaliphorous cells." The nuclei are in the periphery, and the cytoplasm is filled with mucinous globules giving them the appearance of vacuoles.

Chordomas in the cervical region invade the cervical nerve roots and make their presence felt by pain and stiffness of the neck. When they point anteriorly into the pharynx and attain a sufficient size, they interfere with swallowing. The diagnosis must be made from biopsy, and the treatment is surgical. The location of the tumor in the nasopharynx makes the approach difficult. Furthermore, the tumors, by the time they have produced symptoms, have attained such size that it is almost impossible to remove them entirely; hence, repeated surgical procedures are the rule. Radiation is of no value.

REPORT OF CASE

A. P., an Italian man, age 78, was admitted to the Hartford Hospital for investigation and treatment, with the complaint of neck pain aggravated by motion. The patient gave the history of an injury to his head about 10 weeks before admission. This was followed by pain which grew progressively worse. He consulted his physician, who in the course of the physical examination found a firm tumor in the pharynx and advised immediate hospitalization. The rest of the medical history revealed a right herniorrhaphy in 1920 and an attack of coronary occlusion in 1935.

Examination revealed a well-developed, well-nourished adult man in no distress. There was a large, firm, nonfluctuant, nontender mass in the nasopharynx, extending down just below the border of the soft palate to the left of the mid-line. There was one small node in the neck on the left side. The chest was emphysematous but clear. The heart was enlarged but otherwise normal. The abdomen showed the scar of the herniorrhaphy on the right and an easily reducible inguinal hernia on the left. The neurological examination showed the pain to follow the distribution of the third cervical nerve root. Hyperextension or compression of the head and neck

produced pain, and traction relieved it. Roentgen examination of the cervical spine revealed no abnormality. Planigraphs showed a soft tissue mass in the pharynx but no bony erosion. Lumbar puncture revealed xanthochromic fluid with protein at 124 mg. per 100 cc. The Queckenstedt test showed evidence of a partial spinal block. Cervical myelography revealed a nearly complete obstruction of the column of oil at the third cervical vertebra on the right and a complete obstruction of the oil at the level of the second cervical vertebra on the left. An aspiration biopsy

Fig. 1.—The tumor removed was a lobulated but moderately well encapsulated mass measuring 5 by 5 by 2 cm.

Fig. 2.—The cut section showed a soft, almost gelatinous consistency.

was unsatisfactory, and a deep biopsy with the patient under topical anesthesia, was taken on March 23, 1950, from the center of the mass. The report from the laboratory was chordoma.

Although the tumor was extending anteriorly into the pharynx, it was not of sufficient size to produce any symptoms there. However, it was felt that the tumor was extradural and was producing a spinal block and involving the third cervical nerve root, with the resultant neck pains. Therefore, on April 3 the neurosurgical service performed laminectomies of the first to fourth cervical vertebrae. No significant amount of the tumor was removed, but enough was

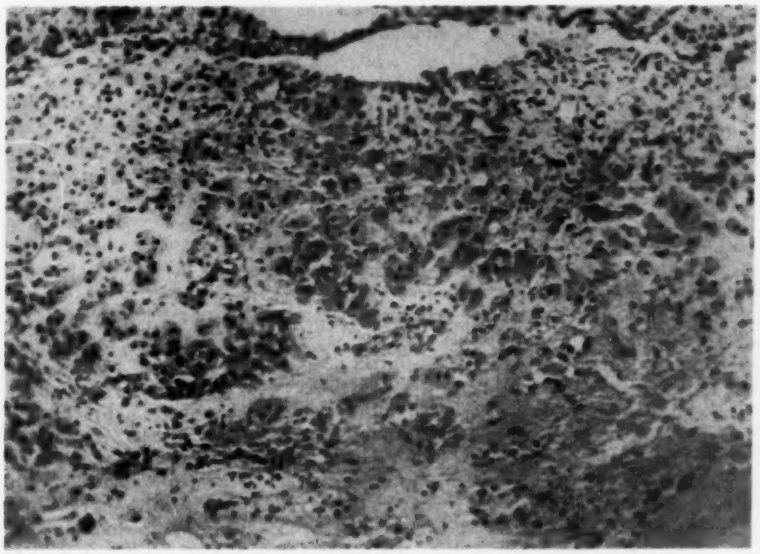

Fig. 3.—Microscopically the tumor is seen to be composed of large polyhedral cells arranged in small masses and strands supported by an amorphous homogeneous myxomatous stroma.

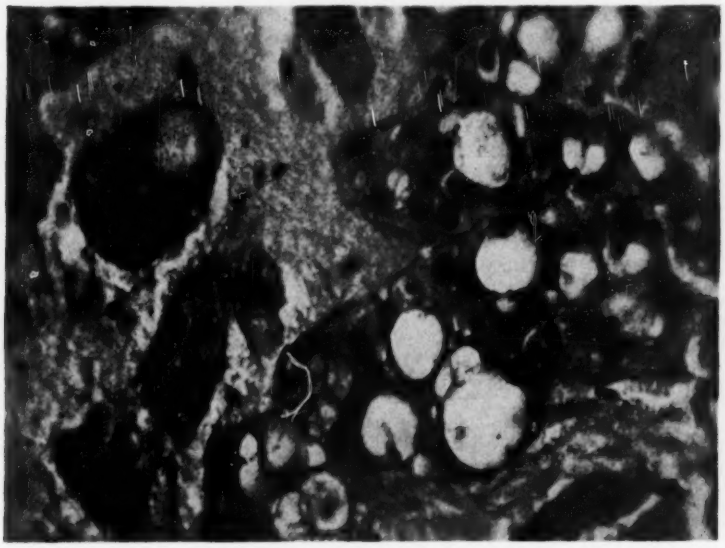

Fig. 4.—Occasional large cells with marked vacuolization of their cytoplasm, typical of the physaliferous type present frequently in these tumors, are seen.

removed to decompress the spinal cord. The dura was seen to pulsate, and the relief of the block was adequate. Severe bleeding was encountered. The patient had a remarkable convalescence and was discharged on the fifth postoperative day, on April 8. He was free of all neck pain.

The patient was seen regularly in the follow-up tumor clinic, and three months later, on July 19, was referred back to the ear, nose, and throat clinic. He was now having difficulty on swallowing. On examination it was found that the tumor in the pharynx was markedly enlarged in all dimensions. It now extended down into the hypopharynx to the level of the epiglottis and laterally across the mid-line, so that his difficulty in swallowing was due to the sheer size and extent of the tumor. The patient was readmitted, and on July 29 the tumor was excised.

The approach was through the mouth, using Davis and Jennings mouth gags and retractors to obtain exposure. The tumor was firm, encapsulated, and bound down with numerous dense bands which were cut and dissected with difficulty. The tumor was found to be attached to the vertebra by a dense stalk above and extended down to the upper border of the larynx below. Medially, it extended across the mid-line to the right and laterally to the mastoid area on the left. The bleeding was fortunately only moderate, and the tumor was shelled out cleanly except possibly above, at its attachment. Laterally, great care was taken to avoid damaging the carotid sheath and the facial nerve. The wound was closed with catgut sutures.

The specimen was a lobulated but moderately well encapsulated mass which measured 5 by 3 by 2 cm. It had a pale yellow-white appearance. When sectioned, the cut surface exhibited a soft, almost gelatinous consistency. The mucinous matrix gave the surface a cystic and papillary character, although no true cysts were present. These features are well seen in Figures 1 and 2. The microscopic findings showed the tumor to be composed of large polyhedral cells arranged in small masses and strands supported by an amorphous homogeneous myxomatous stroma (Fig. 3). Occasional large cells with marked vacuolization of their cytoplasm (Fig. 4) were found. These are typical of the physaliferous type present frequently in these tumors. The mass had a fairly well developed capsule but showed evidence of invasion, indicating the locally malignant character of the process.

Again the patient made a remarkable convalescence. When last seen, 15 months after operation, he was in excellent condition, free of pain, with no difficulty whatsoever in swallowing or breathing, and no local evidence of tumor return.

ADDENDUM

Since this paper was submitted for publication, the patient has been called back for a check-up, and a small regrowth was found appearing in the nasopharynx. This is the first evidence in almost two years since the first operation.

242 Trumbull St.

RHINOLITH

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AND
JACK W. GROSSMAN, M.D.
ALBUQUERQUE, N. MEX.

RHINOLITHS, or nasal calculi, are comparatively rare. Thompson [1] mentioned that 300 cases were reported in the literature up to 1921. Probably not over 25 cases have been reported since that time. It is believed, therefore, that the occurrence is steadily diminishing. They are divided into true and false types. The false type has as a nucleus some type of foreign body such as beads, nut shells, or buttons. The true type has a nucleus of dried mucus, blood, crusts, leucocytes, or bacteria.

Chemically [2] these stones consist of the inorganic salts of calcium, magnesium, and sodium, chiefly phosphates, carbonates, and chlorides. They are usually a reddish gray to dark brown or black. They may be hard and brittle, or soft and friable. They vary from a calculus the size of a small pebble to one weighing 116 gm.[3]

REPORT OF A CASE

E. A., a white man aged 44, a minister, was seen in the Ear, Nose, and Throat Department of the Lovelace Clinic on Dec. 29, 1950, complaining of right nasal obstruction and a foul nasal discharge. He stated that he had had difficulty in breathing through the right nostril for 15 years.

Examination revealed the right nasal cavity to be completely blocked. The septum was pushed to the left. There was pressure atrophy of the mucous membrane on the right. A yellow postnasal discharge was present. The right maxillary sinus was dark on transillumination. The mass filling the right nasal cavity was a reddish-gray color and hard, brittle, and fixed. A lateral roentgenogram of the skull showed a rhinolith measuring 26 by 19 mm. located in the posterior part of the right nasal cavity. This is shown in Figure 1.

With the use of preoperative medication and local cocaine anesthesia, small pieces were broken from the stone until it was reduced in size sufficiently to be pushed through the posterior choanae with the instrument shown in Figure 2. The specimen weighed 27 gm., was of the true type, and is shown in Figure 3. The postoperative roentgenogram in Figure 4 shows some thickening of the lining membrane in the right antrum. On Jan. 4, 1951, this area was irrigated through the inferior meatus, but no pus was obtained. A Proetz suction displacement revealed a moderate amount of mucopus from the ethmoid sinuses. The patient was seen again on April 2 and April 12, 1951, at which time there was some crusting of the nasal mucosa and mild pharyngitis sicca. There were no subjective complaints.

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1. Thompson, S. C.: Diseases of the Nose and Throat, London, Cassell & Co., Ltd., 1926, p. 118.

2. Snyder, J., and Feldman, M.: Rhinoliths: Report of 3 Cases with a Review of the Literature, Ann. Otol. Rhin. & Laryng. **45**:430 (June) 1936.

3. Abu-Jaudeh, C. N.: A Giant Rhinolith, Laryngoscope **61**:27 (March) 1951.

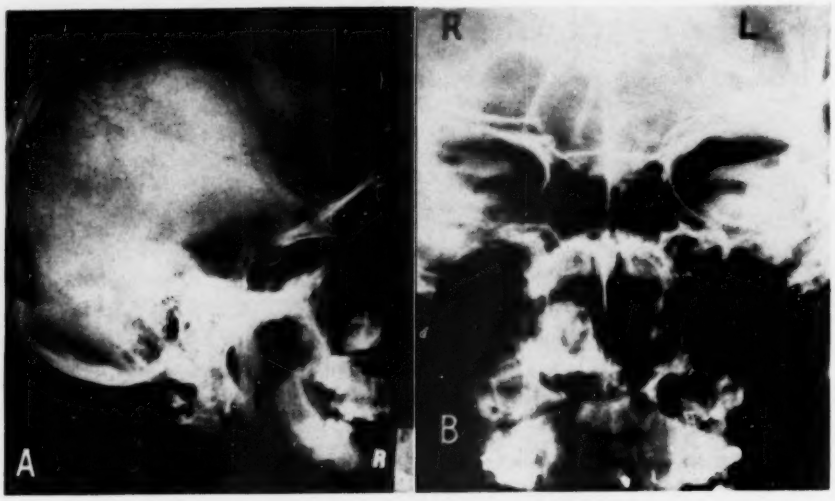

Fig. 1.—*A*, right lateral view of the skull showing rhinolith; *B*, posteroanterior view showing rhinolith in right nasal fossa.

Fig. 2.—Instrument used to remove rhinolith.

Fig. 3.—Rhinolith after removal. A few small pieces are not shown.

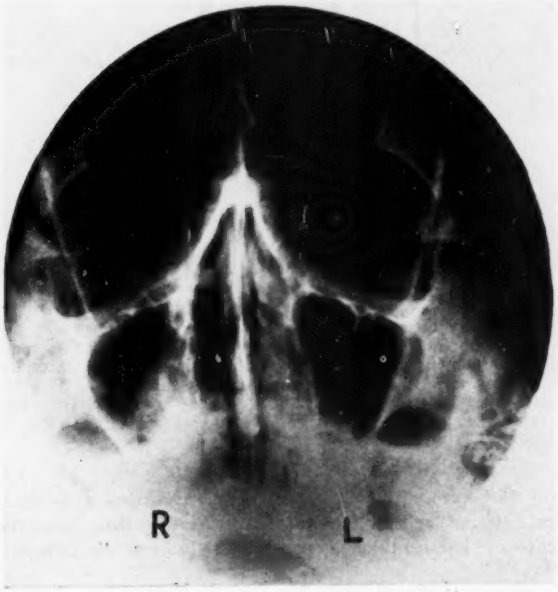

Fig. 4.—Postoperative roentgenogram showing some thickening of lining membrane in right maxillary sinus.

Clinical Notes, New Instruments and Techniques

USE OF THE KAZANJIAN RONGEUR IN RHINOPLASTIC SURGERY

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In 1947 Kazanjian and Holmes,[1] of the Massachusetts Eye and Ear Infirmary, introduced a rongeur designed by Dr. Kazanjian for removing a nasal hump during rhinoplasty. This represented an important advance from the original technique, which had been virtually the standard since it was first devised by Joseph. The older method was to remove the hump by sawing or chiseling the bone and cartilage. This article is written as a report of 32 nasal reconstructions using the Kazanjian instrument for an oversized nose.

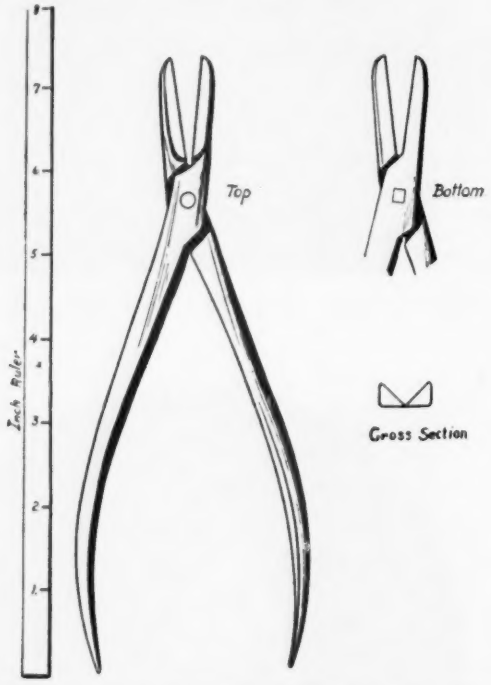

Fig. 1.—The rongeur is shown as seen partly opened and lying on a table. The cross section is made to show the position of the cutting edges. It can be noted that they meet in a plane and on the under surface of the instrument. The angle coming down to this plane prevents the instrument from slipping upward once the instrument starts to bite. This is the instrument that can be used in most cases. The instrument may be compared with the scale for size. (Permission to reproduce Figures 1 through 4 was obtained through the courtesy of Dr. Kazanjian.[1])

KAZANJIAN TECHNIQUE

The skeleton of the dorsum of the nose is exposed by undermining the skin and periosteum through the usual intercartilaginous incisions. Then, rather than using the Joseph saws, the Kazanjian rongeur is inserted through one vestibular incision. By palpation, the blades are

From the Division of Head and Neck, The Beverly Hills Clinic.

1. Kazanjian, V. H., and Holmes, E. M.: New Rongeur for Removing a Nasal Hump, Arch. Otolaryng. **45**:361-364 (March) 1947.

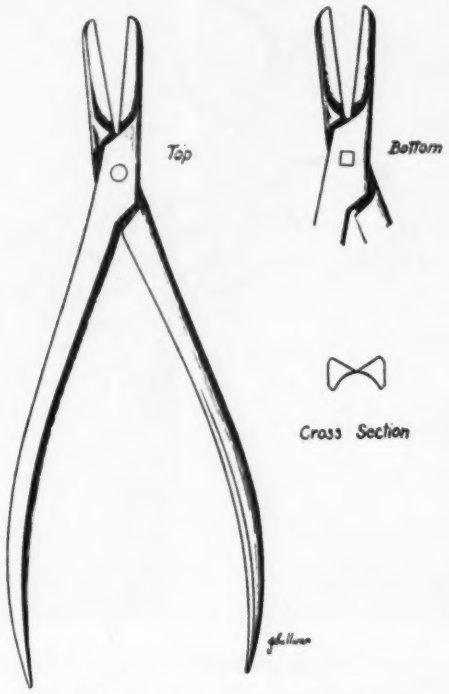

Fig. 2.—This rongeur is employed to remove a hump on a nose whose vestibule is small or cannot be elevated sufficiently. It will be observed that the cutting edges of this instrument are halfway toward the upper surface, so that nearly a quarter of an inch of room is gained.

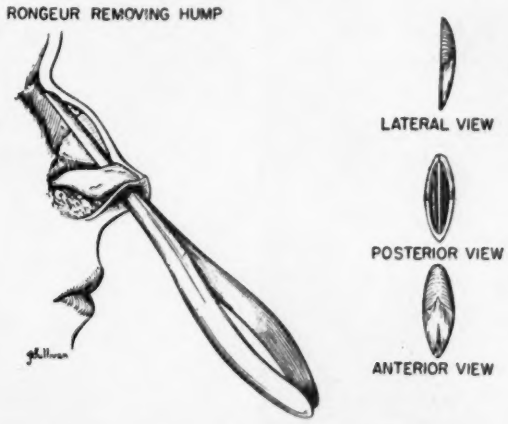

Fig. 3.—This diagrammatic picture illustrates the method of employment of the rongeur. Observe that the tip of the rongeur is at the dorsum near the glabella and that the level of the cutting edges is in the plane of the desired dorsum. At the right are the views of the removed hump. The posterior view shows the lining mucous membrane of the nose.

Fig. 4.—The rongeur here can be seen entering one vestibular incision and ready to be closed, thus cutting off the hump.

Fig. 5.—Preoperative and postoperative appearance of a 28-year-old man who had suffered a striking nasal deformity after a compound fracture of the nasal bones in an automobile accident.

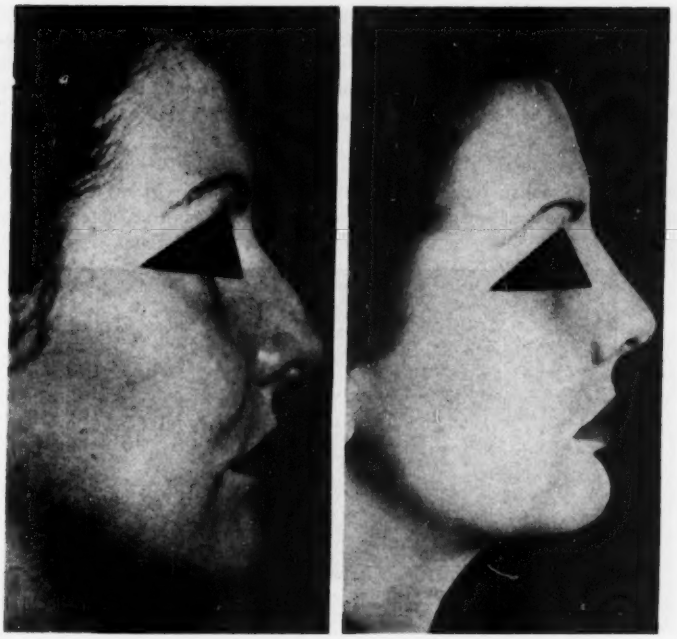

Fig. 6.—Preoperative and postoperative appearance seen in profile of a 26-year-old actress who had experienced a blow to the nose as a child resulting in a fracture-depression of the dorsum.

Fig. 7.—Preoperative and postoperative appearance seen in face view of same patient as in Figure 6.

placed at a chosen level and in a plane which should be in the direction of the final cut (Fig. 3). By applying a slight pressure through the skin over the rongeur, the blades will not slip. With steady gentle pressure on the handles, the blades can be felt to cut into the cartilage and bone. If the tip of the instrument is placed so that it will cut through the nasal bones at a point near the glabella, the entire hump will come away with no need for further manipulation.

RESULTS

The use of the Kazanjian rongeur has been most satisfactory. It makes a single, clean, and straight cut. It is quicker, is simpler, and provides a more symmetrical specimen of bone and

Fig. 8.—Preoperative and postoperative appearance in profile of a 32-year-old housewife with a congenital hump deformity.

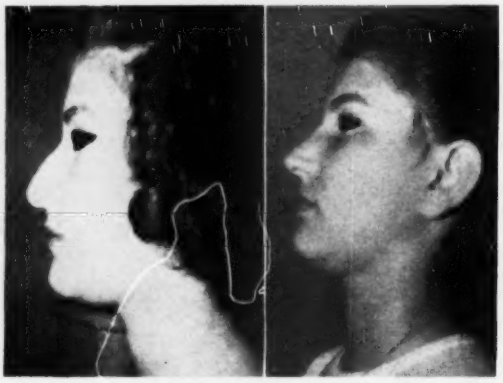

Fig. 9.—Preoperative and postoperative appearance of a 13-year-old girl in whom the Kazanjian rongeur was employed.

cartilage. There is much less need for rasping and smoothing the edges afterward than when the saw technique is used. This reduces the amount of trauma, operating time, and postoperative discomfort.

Of the 32 patients reported the following are typical.

A 28-year-old male artist presented a traumatic nasal deformity following a compound fracture of the nasal bones in an automobile accident. Figure 5 demonstrates the preoperative and postoperative profiles using the Kazanjian technique.

Figures 6 and 7 illustrate the preoperative and postoperative facial and profile appearance of a 26-year-old actress who had suffered a fracture-depression of the nasal bones. The dorsum was trimmed with the Kazanjian rongeur and the nasal bones narrowed thereafter.

A 32-year-old housewife with a congenitally oversized nose is demonstrated in Figure 8. Rhinoplasty with the above-described technique was performed in 30 minutes of actual operating time.

The girl pictured in Figure 9 was 13 years old at the time of surgery.

CONCLUSIONS

The use of the Kazanjian rongeur is considered a major improvement on the traditional Joseph technique of rhinoplasty and has proved superior to the saws, chisels, and rasps now generally used.

133 South Lasky Drive.

DIRECT LARYNGOSCOPY AND DESCRIPTION OF A SELF-RETAINING ATTACHMENT FOR THE LARYNGOSCOPE

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Modern direct laryngoscopy had its inception with the introduction by Killian (cited by Le Jeune [1]) in 1911 of his suspension laryngoscope. Since that time there have been in use four main types of laryngoscopes for direct laryngoscopy. They can be designated as the suspension, bivalve speculum, chest support, and handle-tube types, and a representative of each class is illustrated in Figure 1. A brief discussion of the introduction and mechanical features of each type of instrument may help to clarify the use of the laryngoscope attachment which I shall presently describe.

According to Lewy,[2] Kirstein introduced direct laryngoscopy in 1896, and in 1902 von Hacker inserted a rigid tube into the trachea. The suspension laryngoscope introduced by Killian marked a milestone in the history of laryngology, but the instrument was difficult to use. Atkinson [3] described the Killian laryngoscope as follows: "The spatula had to be accompanied by cumbersome lead plates; modeling compound had to be used to protect the soft parts, thus making the spatula difficult of introduction, and the head hung entirely free from the table, the strained position distorting the larynx, and making it difficult and often impossible to get even the slightest view of its anterior commissure. The surgeon was compelled to look along the spatula from below upward, which necessitated a very high table; and the whole contrivance was a cumbersome and unruly affair." Miller,[4] in speaking of the Seiffert apparatus, stated, "Not only has it overthrown the famous suspension laryngoscope of Killian and its cumbersome and dreadful gallows, but it has made the operation of laryngoscopy a simple one."

Lynch [5] introduced his suspension laryngoscope in 1915, and it was a great improvement over the previously used Killian laryngoscope. It is difficult to say just why this instrument, after the initial enthusiasm it created, later became little used. Its disuse was probably partially due to the fact that it was bulky, required a gallows, and needed a table which was suitable for attachment of the gallows. Le Jeune,[1] in commenting on the decline of the use of the Lynch suspension laryngoscope, stated: "It is interesting to note as the years went by enthusiasm for suspension laryngoscopy dwindled, and it has been my observation that in the past ten or fifteen years very few men continued using this method for the direct examination of the larynx—several of the men manifested surprise and stated frankly that they thought the suspension laryngoscope had been discarded as an antique instrument—so little mention has been made of suspension laryngoscopy in recent years that the younger men apparently know little of this method of direct laryngoscopy."

Atkinson [3] states that both Haslinger and Seiffert introduced their respective laryngoscopes in 1923. The Haslinger laryngoscope was a bivalve speculum and was known as a directoscope.

From the Eye, Ear, Nose and Throat Service, Fitzsimons Army Hospital, Denver.

1. Le Jeune, F. E.: The History of Suspension Laryngoscopy and Bronchoscopy, Mississippi Doctor **17**:83-84 (July) 1939.

2. Lewy, A.: Fifty Years' Progress in Scientific Otolaryngology, A. M. A. Arch. Otolaryng. **53**:646-654 (June) 1951.

3. Atkinson, D. T.: The Development of the Mechanics of Direct Laryngoscopy, Texas J. Med. **22**:696-699 (March) 1927.

4. Miller, J. W.: A Special Lightcarrier for the Seiffert Self-Retaining Direct Laryngoscope with Chest Support, Arch. Otolaryng. **11**:214-215 (Feb.) 1930.

5. Lynch, R. C.: Technic of Suspension Laryngoscopy, Laryngoscope **25**:840-847 (Dec.) 1915.

The Haslinger directoscope was well received, and one writer [6] described it as follows: "Possessing all the advantages of the suspension laryngoscope, and in addition many distinct advantages of its own, and containing none of the objectionable features of any method, or instrument, for direct work within the larynx, up to the present time, is the directoscope of Haslinger. The directoscope of Haslinger seems to be the ideal instrument for endoscopic exposure of the larynx."

Four years after the introduction of the Haslinger scope, Atkinson [3] presented a bivalve instrument which was called a tracheolaryngoscope. The principal claims for this instrument

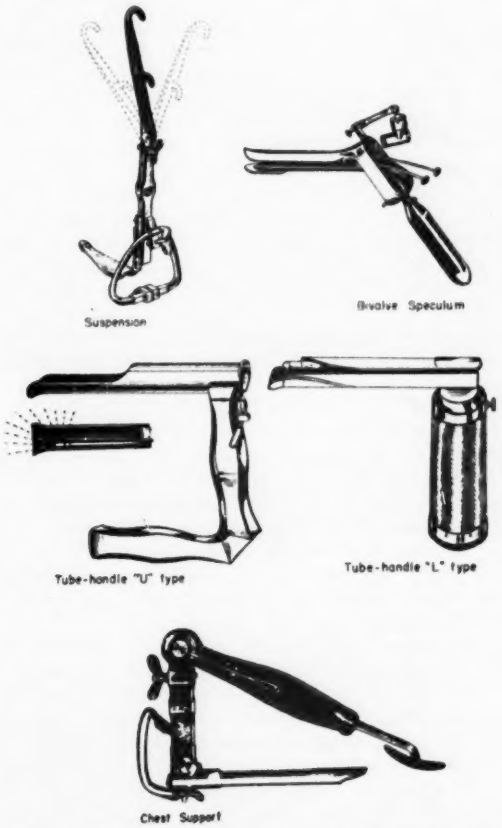

Fig. 1.—Types of laryngoscopes for direct laryngoscopy.

over the Haslinger scope was that its blades were crossed rather than parallel and the hinge was intraoral, thus affording the maximum view of the larynx. It was said to give a view of the trachea down to the carina. The Atkinson scope was accepted as an advance step in laryngoscopy, and Callahan [7] commented on the instrument as follows: "However, modern instruments, and preferably, in the author's opinion, the Atkinson model, have so revolutionized

6. Israel, S.: The Directoscope of Haslinger in the Diagnosis and Surgery of the Larynx, Laryngoscope **33**:945-948 (Dec.) 1923.

7. Callahan, J. F.: The Atkinson Tracheolaryngoscope in Examination and Surgery of the Larynx, Laryngoscope **36**:583-586 (Aug.) 1926.

laryngoscopy that this formerly formidable type of surgery has now become, in its simplicity, such that an average laryngologist may practice with success."

According to Roberts and Forman,[8] Seiffert was probably the first to design a chest-support laryngoscope. The Seiffert laryngoscope was considered an ingenious instrument, its one drawback being that it was unlighted.[4]

In 1948, Roberts and Forman [8] introduced their laryngoscope built on the principle of chest support and self-retention. This instrument has several advantages other than those mentioned, the principal ones being dual distal lighting, nonreflecting lumen, and a wide, well-designed tube. I have used this laryngoscope on many occasions since its introduction and believe it to be an admirable instrument.

Despite the array of fine laryngoscopes which have been introduced, the type most frequently used has been the simplest in construction and most reasonably priced. These laryngoscopes are known as the tube-handle type. The Jackson laryngoscope has been the most popular among otolaryngologists, and the Flagg laryngoscope or one of its modifications has been the most used by anesthesiologists. Robinson [9] states that the Jackson laryngoscope was perfected about 1910. Flagg [10] introduced his self-contained lighting laryngoscope in 1928.

The chief disadvantages of the tube-handle laryngoscopes for operative procedures are that they immobilize one hand of the operator, are difficult to maintain in the proper position, and are tiring to the surgeon. Roberts and Forman [8] have lucidly contrasted the working conditions in the use of a tube-handle laryngoscope with those in the use of a chest-support laryngoscope. They state: "It is a pitiful sight to see a laryngologist make one futile attempt after another to expose the anterior commissure of a nervous, struggling gagging patient. In the end, both he and the patient are exhausted, the patient traumatized, and nothing accomplished. . . . It [the chest-support laryngoscope] relieves the surgeon of an enormous physical strain, especially in his left arm. Several times we have heard the chief ask a younger and stronger assistant to support the laryngoscope because his left arm was exhausted. This does not make for good laryngoscopy because the assistant is doing his job blindly."

The reason for presenting the self-retaining device which I shall describe is mainly its low cost and ready availability. The recent war has demonstrated that instruments can be in short supply, and before the war many of the instruments of the different types described above were no longer obtainable. That a need for such a device exists is demonstrated by the recent introduction of two such attachments. King [11] has described a self-retaining device to attach to the Jackson laryngoscope and he has called this a laryngoscope stabilizer. Recently there has appeared on the market a self-retaining device for the Jackson laryngoscope which is known as the Andrews Chest Support (sold by V. Mueller & Company, Chicago) and to my knowledge has not been described in the literature.

This device costs only a small fraction of the price of instruments now on the market and is simple to assemble. Its operability and utility compares favorably with those of the higher-priced instruments. This device is shown in Figures 2 and 3. I [12] have previously described this device as modified to fit the Flagg type laryngoscope. The parts necessary to construct the device are one window casement adjuster (manufactured by Payson Manufacturing Company, Chicago), one piece of pipe 7 in. (17.78 cm.) long, two hose clamps, and six small bolts with nuts. The details of assembly can be seen in Figure 2.

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8. Roberts, S., and Forman, F. S.: Direct Laryngoscopy: A Simplified Technique; An Aid to the Early Detection of Laryngeal Cancer, Ann. Otol. Rhin. & Laryng. **57**:245-256 (March) 1948.

9. Robinson, V.: Victory Over Pain: A History of Anesthesia, New York, Henry Schuman, 1946.

10. Flagg, P. J.: Exposure and Illumination of Pharynx and Larynx by General Practitioner; New Laryngoscope Designed to Simplify the Technic, Arch. Otolaryng. **8**:716-717 (Dec.) 1928.

11. King, N. E.: Direct Laryngoscopy Aided by a New Laryngoscope "Stabilizer," A. M. A. Arch. Otolaryng. **53**:89-92 (Jan.) 1951.

12. Somers, K.: A Simplified Method of Laryngeal Intubation, Anesthesiology **12**:658-661 (Sept.) 1951.

Both Roberts [8] and King [11] have stressed the importance of good anesthesia when doing laryngoscopy with a chest-support laryngoscope. They both used thiopental sodium intravenously, supplemented with curare. That good anesthesia is a necessity for this procedure cannot be controverted; however, I have found drawbacks to the routine use of thiopental sodium with curare. First, it is considerably more inconvenient than the anesthesia I shall describe in that it requires the services of a third person, an anesthetist. This means that the

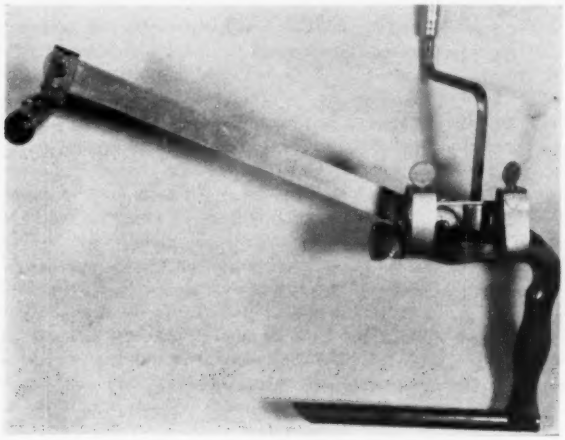

Fig. 2.—Details of assembly of self-retaining chest-support attachment.

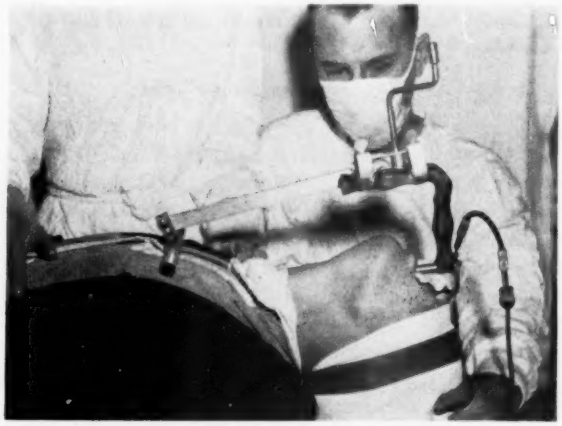

Fig. 3.—Laryngoscope and attachment in use.

laryngoscopy must be at a prearranged time and place convenient to the three parties concerned, and within comparatively narrow limits of time. It consequently places the laryngoscopy in the category of a major surgical operation instead of an office procedure. Second, the patient must be hospitalized to recover from the effects of the general anesthesia. Further, the otolaryngologist must do the topical anesthetization of the pharynx and larynx in either case, for he cannot depend on the curare and thiopental sodium alone to abolish the laryngeal reflexes without using very deep anesthesia. This is true, as several authors have mentioned, because the thiobarbiturates tend to sensitize the laryngeal reflexes.

Dr. Millard F. Arbuckle suggested the main part of the anesthetic which I use, namely, a high dosage of morphine, intravenously. Several years ago Dr. Arbuckle wrote me in part as follows: "With the type of patient encountered in service [Armed Services], I feel sure you will find yourself using one half (½) instead of one quarter (¼) grain of morphine sulphate intravenously. . . . My personal preference for this method is so strong that I never think of using anything else." [13]

The anesthetic routine which I use with the average young soldier is approximately as follows: When the patient reports to the clinic he is given an intravenous injection of pentobarbital sodium. The preparation (sold by Lakeside Laboratories Inc., Milwaukee) is made up with 2½ grains (0.15 gm.) of pentobarbital sodium per cubic centimeter of solution, the solvent being about 60% propylene glycol. This is given slowly in fractional doses; that is, 0.5 cc. is injected and then after a wait of one minute, to observe results, another 0.5 cc. is injected. The desired objective is the point at which it is difficult for the patient to keep his eyes open and at which his speech becomes slurred and thickened. This point is generally reached with about 1 cc. of solution (2½ grains of pentobarbital sodium). The syringe is then disconnected from the needle, and through the same needle ¼ to ½ grain (15 to 30 mg.) of morphine sulfate with atropine sulfate is injected slowly. This solution is made up locally in the strength of ¼ grain of morphine sulfate and 1/200 grain (0.30 mg.) of atropine sulfate to each cubic centimeter and is kept in a sterile rubber-capped bottle. As soon as this intravenous injection is finished, topical anesthetization is started with 10% cocaine on cotton pledgets held in cross action forceps. The last step is instillation of 1 to 2 cc. of 4% cocaine directly into the larynx. The patient is ready for the direct laryngoscopy within about 15 to 20 minutes from the time that anesthesia is first started. After the operative procedure he is sufficiently alert after a short rest so that he can be allowed to go home, provided someone accompanies him.

SUMMARY

A self-retaining device for the Jackson laryngoscope built on the chest-support principle is described. It is of low cost; it can be easily assembled, and the parts are available from common hardware items.

A method of anesthesia suitable for direct laryngoscopy is described. It is rapid and eliminates general anesthesia.

13. Arbuckle, M. F.: Personal communication to the author.

Progress in Otolaryngology

Summaries of the Bibliographic Material Available in the Field of Otolaryngology for 1950

THE PARANASAL SINUSES

SAMUEL SALINGER, M.D.
CHICAGO

THE MATERIAL abstracted below represents all of the references listed in the *Quarterly Cumulative Index Medicus* for the year 1950.

ANATOMY, PHYSIOLOGY, PATHOLOGY, BACTERIOLOGY

Felisati [1] finds a definite association between facial asymmetry and aplasia or asymmetry of the frontal sinuses in 60% of 45 cases investigated. X-ray pictures and reconstructed photographs of the two halves of the face placed in juxtaposition bring out some interesting and striking comparisons. Further studies are necessary to determine the relative amplitude of the two sinuses, and studies of the size and amplitude of the other sinuses are also needed. Enough information, however, is at hand from the present series to show that the embryonic forces may operate unequally in the development of the face, affecting the ultimate size of the sinuses as well as the shape and size of the facial bones. It is possible, also, that this fact may have a bearing on subsequent pathological states.

Cojazzi and Gaja [2] studied 1,154 x-ray pictures of the frontal sinuses to determine whether there is any association between the size of the sinus and the density or texture of the bony walls, as well as the other cranial bones, for possible hormonal etiology. The cases were divided into three groups: (1) those with dense walls and with dense diploe, (2) those with dense walls predominantly hyaline, and (3) those with thin walls and with delicate diploe.

Diagrams show that with increase in the diameter, there is an increase in the number of compartments up to a maximum of five and that there is a corresponding increase in the capacity of the sinus. Another diagram of 500 selected cases shows 50 with dense walls and dense diploe; 35 with dense walls, densely hyaline; 35 with thin walls and delicate diploe, and 380 normal. Also, the index of the capacity of the sinus is in relation to the density of the frontal wall. The volume diminishes in cases in which the wall is thin, with fine diploe.

Swinyard, Dolowitz, Seliger, and Kamrin [3] describe a method of preparing casts of the auditory apparatus and the sinuses by the use of a syrupy mixture of dental acrylic, which is forced into the cavities under pressure. The specimen, usually dried bone or cadaver bone, thoroughly cleansed of all soft tissues, is imbedded in a plaster cast which encloses it completely except for the pipe through

1. Felisati, D.: Rapporti fra asimmetrie sinusali e disrafismo facciale, Riv. clin. med. **49**:192 (Supp. 3) 1949.

2. Cojazzi, L., and Gaja, C.: Richerche statistiche sulla morfologia e la pneumatizzazione dei seni frontali, Oto-rino-laring. ital. **18**:409, 1950.

3. Swinyard, C. A.; Dolowitz, D. A.; Seliger, W., and Kamrin, B. B.: The Use of Dental Acrylic in the Preparation of Pressure Injection Casts of the Auditory Apparatus and Paranasal Sinuses, Anat. Rec. **107**:181 (June) 1950.

which the mixture is to be injected. This procedure is simpler than the use of molten metal formerly employed for the preparation of casts of cavities, and the resulting molds are very attractive as well as useful for teaching purposes.

Kelsmen [4] presents a number of sections of guinea-pig heads showing various anatomic features which, in his opinion, make the animal one of the best available for experimental work. The reasons given are the roominess of the nasal cavity, with absence of accessory sinuses, which "results in less spontaneous pathologic change and more intimate contact of liquid or gaseous materials with the mucous membranes." This is especially valuable for the study of the effects of various medicaments applied locally.

Robison [5] explains the process by which the sinus mucosa and turbinates adapt their tissue pressure to normal and pathological processes in order to facilitate the flow of lymph. As shown in previous articles by the author, the tissues lining the sinuses are deprived of the auxiliary forces present elsewhere in the body, such as muscle contractions, which facilitate the action of the lymphatic bed in removing disease products, and therefore compensate by increased thickness which materially assists the lymph pump mechanism via transmitted arterial pulsation.

Ballenger [6] corroborated Hilding's findings in a series of experiments proving that a negative pressure can be developed behind a mass of mucus in a closed cavity, such as the frontal sinus, through the action of the cilia. Although the degree of negative pressure was less in Ballenger's series than in those reported by Hilding, the difference is explained as due to differences in the quality of the mucus that was employed.

Bazzana and Lombardo [7] present a new type of water manometer for measuring air pressure in the nasal cavities and maxillary sinus. They state that systematic observation will yield valuable information in the diagnosis of disease and in the differentiation between allergic and suppurative states. Recordings of the inspiratory negative phase and the expiratory phase will demonstrate the patency of the ostium. If this is only transient, it will be overcome by the use of vasoconstrictors and subsequent readings will demonstrate the change. If it is due to more permanent changes in the tissues or the presence of fluids, the change may be minimal. Therapy can therefore be more adequately controlled.

Richtnér [8] examined 1,305 workers in the smelting works at Rönnskär for the purpose of discovering the effects of the fume-laden atmosphere on the mucous membrane of the respiratory tract. At the same time 703 workers in other plants in the vicinity where the atmospheric conditions were more favorable were used as controls. Both subjective and objective findings were listed, and in a fair propor-

4. Kelsmen, G.: Nasal Cavity of the Guinea Pig in Experimental Work, Arch. Otolaryng. **52**:579 (Oct.) 1950.

5. Robison, J. M.: The Lymph Pump Mechanism of the Nose and Paranasal Sinuses, Laryngoscope **60**:489 (May) 1950.

6. Ballenger, J. J.: The Production of Negative Pressures by Respiratory Cilia, Ann. Otol. Rhin. & Laryng. **59**:694 (Sept.) 1950.

7. Bazzana, E., and Lombardo, L. E.: Le pressioni aeree nasali e sinusali (mascellari): Valore clinico della loro osservazione, Arch. ital. otol. **60**:390 (Sept.-Oct.) 1949.

8. Richtnér, N. G.: The Rönnskär Investigation: Concerning the Incidence of Changes in the Upper and Lower Respiratory Tract in Employees of the Rönnskär Smelting Works; A Preliminary Report, Acta oto-laryng. **38**:439 (Oct.) 1950.

tion of the groups bronchoscopy was carried out to determine the status of the mucosa of the lower respiratory tract. The results showed that the incidence of changes in the mucosa was much higher in workers at the steel plant than in the other industries, and more pronounced in the group who were continuously employed since before 1935, as compared with those engaged since 1935.

A comparatively large number of the steel workers (8.4%) presented septum perforations in association with atrophic changes in the mucosa. Bronchoscopic changes were less common and seemed to involve the men working at the furnaces far more frequently than those employed in the shop.

This investigation was initiated by the State Institute of Public Health and will probably be continued. A number of graphs accompanying the article break the statistics down into groups according to the organ involved, time of exposure, and type of work.

McMahon [9] discusses the factors predisposing to complications in acute frontal sinusitis. The size of the sinus, disposition of its compartments, and direction and patency of its duct have much to do with the matter of drainage. Thrombosis of venules with retrograde extension by way of the diploe are prime factors in the spread of the infection to the bone and into the cranial cavity. One may have a periostitis, an osteitis, or an osteomyelitis, depending on the degree of infection and the tissues involved. While the pathological picture may be appreciably influenced by the administration of antibiotics, one must be on guard not to be lulled into a false sense of security. The process, though limited by the drugs, may nevertheless have already caused irreversible damage.

Schoolman [10] describes the oncocyte as a senile epithelial cell found only past middle age. It has been discovered in various parts of the body; in the mucous membrane it is usually located in the secretory apparatus and its transition from the normal is first apparent near the base of the cell. The characteristics of this cell are the following: 1. The cell body is enlarged. 2. The protoplasm is finely reticulogranular. 3. The staining of the granules is markedly acidophilic. 4. The nucleus is often shrunken and irregular, tending away from its normal position at the base. 5. It is a differentiated epithelial cell in which the changes progress from the base to the apex. 6. It is not a degenerative phase biologically, because it will increase and grow, although it may cease to function as a gland cell. 7. Though occasionally noted in early life, it is essentially an old-age cell, being found during the cancerous age. 8. Direct relationship to the cancer cell has never been proved. An indirect connection may prove to be more than idle speculation.

Several very clear photomicrographs illuminate the article.

Björkwall [11] sought to determine the normal bacterial flora of the nasal meatuses and maxillary sinus as well as the bacteria present in infection. His object was to discover whether the bacteriological examination of secretions could be of any value in the prognosis or serve as a guide to surgical intervention. Accordingly, 288 examinations were made in 115 persons. The material was divided as follows: 22

9. McMahon, B. J.: Pathology of Acute Suppurative Frontal Sinusitis, Ann. Otol. Rhin. & Laryng. **59**:439 (June) 1950.

10. Schoolman, J. G.: The Oncocyte in the Nasal Mucous Membrane, Arch. Otolaryng. **51**:223 (Feb.) 1950.

11. Björkwall, T.: Bacteriological Examinations in Maxillary Sinusitis, Acta otolaryng. Supp. 83, p. 1, 1950.

controls, i. e., persons with healthy nares and sinuses; 20 patients with unilateral sinusitis; 15 patients with mucoid secretion in the antrum, and 98 patients with purulent antrum secretion. Specimens examined consisted of smears taken from the middle meatus and irrigation fluid recovered after sterile puncture of the sinus.

A summary of the studies revealed that a healthy maxillary sinus is sterile. Cases in which the discharge was mucoid harbored only a few pathogenic organisms; in a few cases pneumococci were present, but in no instance did they find streptococci, Micrococcus catarrhalis, or Hemophilus influenzae (Pfeiffer's bacillus). In cases in which the discharge was purulent, pathogenic bacteria were found in abundance and generally in pure culture. A hemolytic Streptococcus was the commonest agent. Foul-smelling pus yielded a variety of organisms with anaerobes frequently identified.

The prognosis in sinusitis for healing without surgery seemed to be poorest in cases caused by streptococci. Patients in whom only Micrococcus pyogenes var. albus (Staphylococcus albus) and/or Corynebacterium was present during treatment generally tended to get well without surgical intervention.

Steen and Berdal [12] report a case of recurring maxillary sinusitis in a man of 51 which was due to a Gram-negative diplobacillus identified as a mucoid variant of Moraxella liquefaciens Petit. The patient was apparently cured after receiving 14 injections of an autovaccine.

The infective agent is classified as belonging to the genus of the Morax-Axenfeld bacillus, but differing in that it grows at room temperature and in peptone water without the addition of serum. However, it resembles the Petit bacillus in most respects, being considered a mucoid variant.

Fox and Niles [13] maintain that the nomenclature of nasal and sinus disease is inadequate and offer a new classification. Since nasal and sinus diseases usually coexist, a separate classification is redundant. Furthermore, nomenclature based on tissue changes is inadequate because a variety of these changes may be present in a given case. Furthermore, symptomatology alone is inconclusive, because a symptom may be common to a number of conditions. Fox and Niles therefore suggest a classification in which the dominant pathological condition is combined with the dominant symptom. For instance, suppurative rhinosinusitis is subdivided into bacterial, fungous, viral, and rickettsial. Hyperplastic rhinosinusitis allergica is subdivided into seasonal and perennial. The former is subdivided into manifest, clinical, and borderline, or subclinical. The latter is further subdivided into suppurative, hyperesthetic, vasomotor, or obstructive, neuralgic, etc.

The various divisions in the classification are briefly discussed. (The entire list comprises some 30 separate designations which seem descriptive enough but in some instances are too long for comfortable expression—e. g., "Hyperplastic rhinosinusitis allergica—seasonal-subclinical-hyperesthetic.")

Van Metre [14] by means of a 22.5 volt dermometer measured the skin resistance in a number of patients with acute sinusitis and found an abnormal recording in

12. Steen, E., and Berdal, P.: Chronic Rhinosinusitis Caused by Moraxella Liquefaciens Petit, Acta otolaryng. **38**:31 (Feb.) 1950.

13. Fox, N., and Niles, L. M.: Classification of Chronic Diseases of the Nose and Accessory Sinuses, Arch. Otolaryng. **52**:900 (Dec.) 1950.

14. Van Metre, T. E., Jr.: Low Electrical Skin Resistance in the Region of Pain in Painful Acute Sinusitis, Bull. Johns Hopkins Hosp. **85**:409 (Dec.) 1949.

the region of the pain. He attributes this reduction in the skin resistance to sympathetic activity in this region. A number of diagrams are shown with the areas of pain outlined and the areas in which the skin resistance was reduced. This pattern returns to normal after the pain has disappeared. The author believes that this procedure may prove of great value in the diagnosis of sinusitis. Further studies are required to determine whether these areas of reduced resistance are present in cases of acute sinusitis without pain and whether similar findings are present in cases of facial pain not due to sinusitis.

Fitz-Hugh, Moon, and Lufton [15] report positive Papanicolaou stains in 6 of 72 cases of maxillary sinusitis which were confirmed at operation. Despite the fact that in these cases malignant change was obvious from the clinical signs alone, the authors believe that the smear technique is a valuable one which can be applied in all suspect cases of carcinoma involving the antrum.

The procedure followed was irrigation of the antrum with a warm saline solution, 50 cc. of which was collected and added to an equal amount of 95% ethyl alcohol. This was then centrifuged for 30 min. at medium speed (3,000 rpm). The sediment was collected and spread evenly on slides previously coated with egg albumin. The slides were immersed in a solution of equal parts of 95% ethyl alcohol and ethyl ether. The staining was done according to the Papanicolaou technique with hematoxylin, orange G 6 and EA 65. The findings were classified in five groups as suggested by Papanicolaou. Typical slides are shown illustrating the various types of cells recovered.

Boenninghaus [16] shows the value of overextension of the head for axial projection of the frontal sinus from below. By way of example he presents two roentgenograms, one taken in the Waters projection, the other in the overextended axial projection. The former shows a shadow in the antrum but no clouding of the corresponding frontal sinus. The latter clearly reveals clouding of the frontal sinus. Operation revealed pus in the frontal sinus with erosion into the orbit. It should be pointed out, however, that the patient had clinical evidence of orbital infection in the form of an inflammatory swelling of the lids and local tenderness.

Leiber [17] urges careful roentgenologic studies of the sinuses of children for evidences of focal infection which may be the cause of unexplained fevers, pulmonary conditions, and other constitutional disorders. Routine roentgenograms of the sinuses in 402 children who were being examined for pulmonary conditions revealed 56 (14%) with positive findings. The two projections that were found most valuable were the routine posteroanterior and the half-axial. Using a softer ray than for adults, one can show differences in the thickness and contour of the lining mucosa as well as the extent and boundaries of the bony walls. In some cases it may be advisable to employ a contrast medium.

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15. Fitz-Hugh, G. S.; Moon, C. N., Jr., and Lufton, C. H., Jr.: Cytological Smear Technique in the Diagnosis of Carcinoma of the Maxillary Sinus, Laryngoscope **60**:376 (April) 1950.

16. Boenninghaus, H. G.: Beitrag zur Röntgendiagnose einer Stirnhöhlenerkrankung mit Hilfe der überkippten axialen Aufnahmerichtung, Ztschr. Laryng. Rhin. Otol. **29**:398 (Aug.) 1950.

17. Leiber, B.: Die Röntgendurchleuchtung der Nasennebenhöhlen beim Kinde, Ärztl. Wchnschr. **5**:185 (Mar. 30) 1950.

Stromme [18] points out the disadvantages of the smear technique for the determination of the degree of eosinophilia in the diagnosis of allergy as a factor in sinus disease. The cells frequently appear in clumps at irregular intervals and it is impossible to determine the approximate percentage of all the cells that they may represent. Another disadvantage is in the fact that the cells are easily traumatized; besides, the stains will not yield uniform results because of varying pH, which affects the staining. For more accurate appraisal of the secretions, the author suggests a cytohistological process, based on Silverstolpe's technique, whereby repeated centrifuging of the secretions reduces the residue to a solid mass which can be cut and stained like any ordinary histological specimen and which will show the cells evenly distributed and distinctly stained.

Glass [19] presents a thorough review of the anatomy of the maxillary ostium, a history of the procedures employed for irrigation, and an analysis of the pros and cons regarding catheterization via the natural ostium. He describes the procedure in detail with illustrations. The advantages of this method are the following: 1. It can be successfully carried out in four out of five cases. 2. It can be used on people who would not tolerate a single or a second puncture. 3. Repeated washings are easily tolerated. 4. The unpleasant sensation and sound of a puncture through bone are absent. Failure to enter the ostium may be due to the following factors: "(1) low hanging middle turbinate crowding the lateral wall; (2) a deep infundibulum with horizontally placed ostium in the depths or a vertical ostium not projecting above the level of the uncinate crest; (3) an anatomically narrow or pathologically occluded infundibulum; (4) a marked septal deviation; (5) a bulging atrial region preventing visualization of and approach to the midmeatus; (6) a large overhanging bulla (rare)."

However, the author adds that many cases of failure are due to inadequate preparation and lack of experience on the part of the operator.

The solution recommended for irrigation is a slightly hypertonic Fischer-Bledsoe solution (22 cc. in 500 cc. of boiled water). (Fischer-Bledsoe solution is composed of sodium chloride, 263.7 gm.; dried calcium chloride, 21 gm.; potassium chloride, 10.6 gm., and sufficient distilled water to make 1,000 cc.) The advantages claimed for this mixture are that it is an effective solvent for mucin and also "mechanically removes organisms, their enzymes and food supply and by virtue of its chemical composition and hypertonicity (as used) assists the reduction of mucosal edema and the prevention of granulomatous inflammatory changes and fibrosis."

For contrast media in diagnosis the author prefers the aqueous type of iodine to the oily, because it is less irritating and more stable.

The article is very informative and worthy of detailed study.

Dimond,[20] in discussing the value of roentgenograms in diagnosis of sinus disease, calls attention to a difference of opinion between British and American authors on the question of differentiating infectious sinusitis from allergic sinusitis. He quotes several American authors as maintaining that bone rarefaction is associated

18. Stromme, O.: A Cyto-Histological Method as a Diagnostic Aid in Allergic Antral Sinusitis, Ann. Allergy **8**:362 (May-June) 1950.

19. Glass, M.: Catheterization of the Natural Openings of the Antrum of Highmore, South African M. J. **24**:446 (June 10) 1950.

20. Dimond, J. L.: Evaluation of X-Ray Examination in Sinusitis, New Zealand M. J. **49**:290 (June) 1950.

with allergic conditions but does not occur in acute sinusitis. Graham Hodgson, on the other hand, states that decalcification with blurring of the bony outline is characteristic of infectious sinusitis. The author feels that this statement needs further clarification.

Roentgenograms of the sinuses are helpful in demonstrating polypi and cysts, fluid level, hyperplasia, and bone involvement. They cannot establish the diagnosis by themselves but may prove a useful adjunct to the clinical picture.

INTRACRANIAL COMPLICATIONS

Caliceti [21] seeks to connect certain chronic inflammatory processes in the nasopharynx and sinuses with various neurovegetative endocranial syndromes from etiologic and pathogenic viewpoints. With many references to the literature he describes the mental turpitude, tendency toward somnolence, slow cerebration, etc., so frequently associated with adenoids, certain tumors, and infections of the sphenoid bone. Also, certain manifestations of pituitary dysfunction have been linked with infections of the sphenoid and nasopharynx. Toxic products may be transmitted via the vascular communications, the lymphatics, and also directly through a low-grade osteitis. In cases in which the patient has definite symptoms of a sinus infection the diagnosis is not difficult. Uncertainty, however, arises in those instances in which the sinus infection is only suspected but is difficult to prove. Here one must carefully seek for slight localized alterations in the mucosa of the turbinals, streaks of secretion in the upper meatus, and inflammatory signs about the nasopharynx. Careful roentgenographic studies may disclose bony changes at the base and about the sinus walls. Also, studies with contrast media may reveal minimal changes.

In some instances in which pathogenesis is less clear one may obtain valuable information from an analysis of the family history and personal history of the patient. A general metabolic dysfunction with lowered resistance may account for the simultaneous appearance of a chronic sinusitis or nasopharyngeal disorder in conjunction with a cranial dystrophy.

It is thus apparent that many factors have to be taken into consideration in analyzing a particular case. Yet in no instance should the possibility of a latent posterior sinus infection be overlooked, since in many cases there is a direct connection between this and sinusitis.

Koumrouyan [22] reports two cases of nonsuppurative encephalitis complicating an ethmomaxillary infection, which presented many interesting features. The first was that of a child of 9 years with bilateral acute suppurative ethmomaxillary infection due to Streptococcus and Staphylococcus aureus, complicated by an orbital abscess and meningitis. Although improvement followed local drainage and antibiotic therapy, the patient suddenly began to have convulsions, followed by a complete hemiplegia with aphasia and facial paralysis. The aphasia and facial paralysis disappeared within 24 hours, but the hemiplegia lasted for two months.

The second case was that of a woman of 25 with an acute suppurative maxillary sinusitis due to an anaerobic Streptococcus, in whom after a seige of chills and fever

21. Caliceti, P.: Flogosi croniche faringo-naso-sinusali in riferimento alle sindromi neurovegetative e alle endocraniosi, Oto-rino-laring. ital. **18**:319, 1950.

22. Koumrouyan, H.: Encéphalite localisée non suppurée avec hemiplegie transitoire et definitive consecutives aux sinusites ethmoido-maxillaires, Pract. oto-rhino-laryng. **12**:84, 1950.

hemiplegia with aphasia and facial paralysis developed. There were no signs of meningitis or venous thrombosis. Other symptoms (ocular) pointed to brain abscess. However, craniotomy and probing in various directions failed to disclose any pus. Recovery was slow; the facial function came back in a short time, but after 20 months the spastic hemiplegia was still present and there was only partial recovery from the aphasia.

In discussing this syndrome the author calls attention to the varied nomenclature under which it has been described—cerebral edema, collateral encephalitis, etc. He also points out the difficulty in distinguishing it from a true cerebral abscess. It appears from his discussion that, despite symptoms pointing to brain abscess, it is safer to delay exploring the brain as long as possible for two reasons: First, if it is a true abscess the additional waiting period will permit better walling off, and, second, the focal symptoms will become better defined. Another point in the differentiation is the fact that brain abscess develops more gradually, whereas in the cases described the onset was sudden—in fact, almost explosive. Speculation as to the routes by which the infection reaches the brain is given some consideration, as is an analysis of the spinal fluid findings. Cases of this type, in which the encephalitis arises from sinus infection, are much rarer than those in which it is due to an otitic focus.

Camisasca [23] reports a case of serous meningitis of one year's duration in a woman of 20, whose symptoms were recurring attacks of severe frontal headache and a moderate elevation of temperature. Roentgenograms revealed a slight hyperostosis frontalis in addition to signs of an antrum and ethmoid infection. Spinal fluid findings were increased pressure with albumin but no cytologic changes. The antrum and ethmoid sinuses were operated on and the tonsils removed, with only temporary relief. Sulfonamides and penicillin also failed to yield any results. The case was complicated by an allergic background. However, the author believes the sinus infection was the original focus of the spread to the meninges. The symptoms finally abated after the patient was given 20 intravenous injections of an iodide preparation and 12 exposures to high voltage x-rays.

Engler and Braden [24] call attention to the importance of ever bearing in mind the possibility of an intracranial lesion when confronted with a case of headache suggesting frontal sinus disease. They cite 13 cases briefly, comprising a variety of intracranial disorders such as frontal lobe abscess, aneurysm of the internal carotid artery, cortical hemangioma, intracortical hemorrhage, osteoma, and meningioma. These are all very instructive and emphasize the importance of thoroughness in the examination and the necessity for keeping an open mind.

Pellnitz [25] reports a case of frontal lobe abscess complicating an acute exacerbation of chronic frontal sinusitis, in which the focal symptoms of aphasia, agraphia, and contralateral hemiplegia appeared after a complicating meningitis had been brought under control. He comments on the difficulty of diagnosis in such a case

23. Camisasca, L.: Considerazioni su di un caso di sinusite etmoido-mascellare con perisinusite e meningite sierosa, Oto-rino-laring. ital. **18**:342, 1950.

24. Engler, C. W., and Braden, S.: Intracranial Lesions Simulating Frontal Sinus Involvement, Laryngoscope **60**:451 (May) 1950.

25. Pellnitz, D.: Motorische Aphasie und Agraphie bei rhinogenem Hirnabzess, Ztschr. Laryng. Rhin. Otol. **29**:214 (May) 1950.

because of the meningeal symptoms, which overshadow those caused by the abscess in its early stages. Headache and disturbed reflexes are common to the two conditions, and the persistence of the headache after the meningitis had cleared was the first indication of the cerebral abscess, since the focal symptoms did not appear until late. Penicillin and chemotherapy during and after the frontal sinus operation are credited with resolving the meningitis. With the appearance of the focal symptoms, a second operation through the frontal region uncovered the abscess, which was drained through a glass tube. Penicillin was given intrathecally as well as locally. The patient recovered.

Borasi,[26] as a result of roentgenologic, clinical, neurologic, and ophthalmologic studies in 11 cases of ozena, found a definite association with sinusitis and bony changes in surrounding areas, such as perisinusitis and hyperostosis frontalis. The prevalence of cephalgia and symptoms of diencephalic-pituitary disturbance in these cases can be explained only on the basis of extension of a low-grade infection from the nasal sinuses to the endocranium. Furthermore, Borasi does not believe that the endocrine neurovegetative disturbance in cases of chronic sinusitis constitutes a hereditary predisposition to ozena. On the contrary, he believes the reverse to be more consistent with the findings, namely, that the frontobasilar inflammation resulting in the dystrophies mentioned can be ascribed to the association of chronic sinusitis and ozena by way of the intervening bony walls.

Andreoni and Pisani [27] studied 50 patients with a variety of neurovegetative and hormonal disturbances associated with chronic sinusitis and perisinusitis, with reference to their allergic responses as well as their sedimentation rates. Such conditions as neurovegetative gastroenteritis, gastrointestinal ulcer, hyperthyroidism, adiposogenital dystrophy, diabetes insipidus, gigantism, and migraine were present. The sedimentation rate was found to be low in all cases. As for the allergic factor, the investigation suggested that an allergic tendency in the patient could act as a stimulus to the development of real neurovegetative endocrine syndromes through a shock organ, represented by the sphenodiencephalic complex.

Tello,[28] comparing his results in two groups of cases observed between 1945 and 1949, found that the mortality of intracranial complications was reduced from 59 to 25%. All the patients received adequate antibiotic therapy and chemotherapy. The author states that in the first group, in which the results were poorer, the absence of clinical findings resulting from the chemo- and anti-biotic therapy was misleading. The better results obtained in the second group were due to a prompter surgical eradication of the initial focus.

Maxwell [29] finds that complications of acute frontal sinusitis frequently result from inadequate therapy applied too late, insufficient amounts of antibiotics, use of drugs that are not specific for the type of infection present, and rapid extension of

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26. Borasi, G.: Alterazioni perisinusitiche ed endocraniche fronto-basilari nell' ozena nasale, Oto-rino-laring. ital. **18**:378, 1950.

27. Andreoni, O., and Pisani, G.: Allergometria e velocità di sedimentazione nelle sindromi neurovegetative e negli stati disormonneurovegetativi da sinu-perisinusite cronica, Oto-rino-laring. ital. **18**:402, 1950.

28. Tello, T. A.: Estudio del foco oto-sinusal agudo, oculto o semi oculto y su tratamiento, en las complicaciones encefalicas agudas tratadas con antibioticos, Rev. otorrinolaring. **10**:1 (March) 1950.

29. Maxwell, J. H.: Acute Suppurative Frontal Sinusitis: Intracranial Complications, Ann. Otol. Rhin. & Laryng. **59**:45 (June) 1950.

the infection beyond the natural boundaries of the sinus. The last-named is most likely to occur in fulminating infections due to Hemophilus influenzae or to follow acute exanthemata or swimming. In very young children, one finds an extracranial accumulation of pus the most frequent complication. An acute exacerbation of a chronic infection is more likely to produce osteomyelitis. The various routes of extension to the endocranium are mentioned, and the varieties of complications ensuing are described in compact style. Differential diagnosis between frontal lobe abscess, subdural abscess, and even epidural abscess may at times be difficult. Diagnostic trephination, ventriculography, and exploratory tapping may be necessary to reveal the focus accurately. Surgery at first may have to be limited to release of accumulated pus, with radical excision to follow after the process has been well delineated.

Grad [30] cites three cases of contralateral brain abscess, one of otitic origin, the other two following frontal sinus infections. Neither of the patients with sinus infections survived, and the autopsies and histopathologic findings are completely recorded. The author states that the development of a contralateral brain abscess is very rare, Korner having reported such abscesses as comprising 7% in a series of 90 otogenic brain abscesses; they are probably less common after sinus infections. The explanation in the cases of otitic origin is not too difficult, because of the rich vascular communications via the large venous sinuses. In the case of contralateral brain abscess due to sinus infection, analysis of the pathways is more difficult.

However, in the two cases cited by the author, thrombosis of the superior longitudinal sinus was present, though previously undiagnosed, and provided the pathway by which the infection was carried to the opposite side. In both cases a subdural abscess was found on the same side as the cerebral abscess, and in both cases the frontal sinuses on the abscess side were unimpaired. The author calls attention to the fact that thrombosis of the superior longitudinal sinus rarely gives rise to any characteristic symptoms, accounting for the fact that it is frequently overlooked. However, he shows that an infection of the sinus may be the means of spreading infection to remote areas, because the vein has communications with the dura, the frontal sinus, the frontal bone, the brain, and the arachnoid space.

Johnson [31] comments on the marked reduction in the incidence of intracranial complications due to the antibiotics and cites several cases to illustrate the results of surgery combined with use of antibiotics in therapy. Subdural empyema and brain abscess resulting from sinus infection are commoner than meningitis.

The symptoms and diagnosis are discussed, as well as indications for surgery. Subdural empyema is treated by drainage through one or two enlarged burr holes in the lateral frontal region. Brain abscess, when localized, is aspirated, and the cavity is then filled with an antibiotic. This may be repeated, or, if indicated, permanent drainage may be effected through an indwelling rubber tube. If the abscess is superficial, it may be induced to marsupialize.

Ventriculography and encephalography were found to be very useful in the diagnosis and localization of abscesses.

30. Grad, W.: Über contralaterale Hirnabszesse, Ztschr. Laryng. Rhin. Otol. **29**:16 (Jan.) 1950.

31. Johnson, C. I.: Intracranial Complications of Otogenic and Rhinogenic Disease, Texas J. Med. **46**:287 (May) 1950.

A case of thrombosis in a 20-year-old man was reported by Elfman,[32] the symptoms of orbital involvement following closely on an acute upper respiratory tract infection with rapid involvement of all the sinuses on the affected side. Incidentally, the patient was a diabetic who had not adhered closely to the prescribed regimen. Heparin, bishydroxycoumarin (dicumarol®), sulfadiazine, and penicillin were prescribed. Meningitis appeared within two days, and the author then did an exenteration of the sphenoid bone and ethmoids, which were found to be necrosed and full of cheesy purulent material. Streptomycin was then added to the therapy. For seven weeks the patient received large doses of insulin, 50 mg. of heparin sodium every four hours for two days, 200 to 300 mg. of bishydroxycoumarin daily for four days, about 1,000,000 units of penicillin daily, 3 gm. of streptomycin daily for four weeks, and 1 gm. of sulfadiazine every four to six hours for four weeks. Several months later the blind eye was enucleated, and a persisting fistula in the upper lid was traced finally to an abscess deep in the orbit in front of the optic foramen and sphenoid fissure. The patient finally recovered.

ORBITAL COMPLICATIONS

Reuter[33] discusses the relation of sinus infection to infections of the orbit, including retrobulbar neuritis, and cites five cases. In 1 case, orbital cellulitis responded to chemotherapy, and no surgery was performed, since the roentgenograms indicated that the sinuses were normal. The second yielded primarily to the same therapy, but after six weeks swelling of the infraorbital border developed. Roentgenograms indicated frontal sinus involvement, and a radical operation disclosed a pyocele. In the other three cases the patients were women, all with typical findings of retrobulbar neuritis. The ethmoids and antrums were opened and drained. In two cases definite pathology was encountered. In the third case no disease was demonstrable. The author is at a loss to account for the prompt cure which followed, as it did in the other two. He is therefore convinced that exploratory opening of the ethmoids and the sphenoid bones is advisable even if they appear clinically to be normal.

Dimsdale[34] classifies oculomotor lesions due to sinus disease as caused by "toxi-infective neuritis, direct pressure by a distended sinus, usually the sphenoid, after erosion of bone, [or] involvement by edema and secondary proliferative changes in the superior orbital fissure." The first type is illustrated by the case of a 52-year-old woman in whom, during an acute upper respiratory infection, right frontal pain, partial ptosis, and diplopia developed. The symptoms disappeared after adequate treatment of the acute frontal sinusitis. Two years later similar symptoms on the left side developed with complete third nerve palsy. Recovery took place within a month. The author states that the sinus infection caused the nerve paresis by way of a toxic infective process rather than by direct extension. The second type is illustrated by the case of a 59-year-old woman with a history of chronic sphenoid infection causing direct involvement of the third nerve due to erosion of the body of the bone as shown in the roentgenogram.

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32. Elfman, L. K.: Thrombosis of the Cavernous Sinus, Arch. Otolaryng. **51**:188 (Feb.) 1950.

33. Reuter, G.: Über die Beziehungen der Nasennebenhöhlen zur Orbita und zum N. opticus, Ztsehr. Laryng. Rhin. Otol. **29**:224 (May) 1950.

34. Dimsdale, H.: Ocular Palsies Due to Infection of the Nasal Sinuses, Tr. Ophth. Soc. U. Kingdom **68**:197, 1948.

A case illustrating the third type was one in which a periostitis of the sphenoidal fissure in association with infection of the anterior group of sinuses was present. Pain, proptosis, and ophthalmoplegia with occasional involvement of the fifth nerve may be present. The course is prolonged and recovery never entirely complete. Three cases of this type are cited.

Wessely and Guist,[35] citing four typical cases of retrobulbar neuritis in which the condition cleared up after surgery of the sinus, are convinced that there is a definite etiologic relationship. The incidence will depend on the anatomic features, the disposition of the blood vessels, and the virulence of the bacteria. Improvement of the vision following the shrinking of the nasal mucosa in the upper meatuses, even in the absence of definite signs of sinus disease, emphasizes the close relationship between the sinuses and the orbit via communicating blood vessels. Permanent improvement following surgery cannot be denied and has been demonstrated innumerable times. Unfortunately, histologic specimens are difficult to obtain, and therefore the final proof is still unavailable.

Moulton [36] describes the usual symptoms of extraocular and intraocular involvement from sinus disease and lists the pathways of infection. A number of typical cases are presented, illustrating types of infection, such as osteomyelitis due to frontal sinusitis, orbital abscess following septal abscess, orbital cellulitis due to ethmoiditis, and retro-orbital abscess due to antrum and ethmoid infection.

The author comments on the fact that although antrum infection was present in three of the cases presented, the orbital complication was attributed to the ethmoiditis rather than the maxillary sinus. In most cases the conditions occurred during the winter months, a fact that suggests chilling with lowered resistance, as well as the drying effects on the ciliary activity, as contributing causes.

Orbital complications are less frequent than formerly, owing to the use of antibiotics. Nevertheless, drainage is important.

Costi [37] cites several cases of conjunctivitis due to staphylococcic infection of the sinuses in which the condition cleared up after the sinus infection was cured. He maintains that the conjunctival reaction was an allergic one and not a direct infection. Cultures from the conjunctival sac were sterile. Treatment consisted of instillation of an autovaccine obtained by culture of the offending organisms. This vaccine was instilled into the eyes and applied to the nasal cavities with a nebulizer.

McKenzie [38] reports nine cases of orbital cellulitis complicating sinus infections, eight of which were due to an ethmoid infection. The condition is readily differentiated from cavernous sinus thrombosis by the fact that the patient does not appear acutely ill and signs of blood stream involvement are absent. He finds that most patients recover under prompt and adequate intranasal drainage combined with sufficient antibiotic therapy. External incision is usually not required.

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35. Wessely, E., and Guist, G.: Die Behandlung der retrobulbären Neuritis mit Berücksichtigung von Erkrankungen der Nase und ihrer Nebenhöhlen, Klin. Monatsbl. Augenh. **116**: 175, 1950.

36. Moulton, O. C.: Ophthalmic Signs of Naso-Orbital Disease, Tr. Pacific Coast Oto-Ophth. Soc. **30**:121, 1949.

37. Costi, C.: Conjunctivitis alergicas por doco septico nasal, Arch. Soc. oftal hispano-am. **9**:1293 (Dec.) 1949.

38. McKenzie, W. R.: Acute Sinusitis with Orbital Cellulitis, South. M. J. **43**:240 (March) 1950.

SINUSES AND THE PULMONARY TRACT

Guerrant, McCausland, and Swineford [39] found a wide divergence in the percentage of sinus disease associated with asthma in an analysis of a number of reports in the literature. These varied from 25 to 87%. In their own series of 720 unselected office asthma patients between the ages of 12 and 60, the authors could find only 25% showing unmistakable evidence of suppurative sinusitis. The inconsistency of the various groups of statistics is ascribed to varying criteria employed in the diagnosis. In their own series they would tabulate a case as one of a true infectious sinusitis only if both roentgenograms and physical findings were definitely positive. Roentgenograms alone are not dependable because control studies have shown positive x-ray findings in a large percentage of normal persons. Selected for study were 71 patients in whom no other complicating factors were present. Of these, 34 were subjected to radical surgery, while 37 were given conservative treatment, which included submucous resection, polypectomy, and intranasal antrostomy. In the first group the results were poor in 9, definitely improved in 16, and excellent in 9. In the second group the results were poor in 7, improved in 13, and excellent in 17.

Since all of the cases were thoroughly worked up, the results tabulated are worthy of careful consideration. Conservative therapy was instituted for as long as 12 months before radical surgery was contemplated. Consequently, only the most obdurate cases were finally selected. The authors found that the 16 patients in whom the results were poor either failed to cooperate or were emotionally disturbed. Also, nonatopic patients yielded better results than atopic patients. Furthermore, the results in general were better in patients past the age of 30. Several cases are cited demonstrating the various factors which influence the prognosis and the various procedures adopted. It is altogether a very clear analytical report.

Bergstrom, Cook, Scannell, and Berenberg [40] present an interesting report of two cases of Kartagener's triad and two cases of chronic sinusitis and bronchiectasis among six siblings. The first two also had additional anomalies; one, hypospadias, the other, congenital heart disease. A discussion of the pathogenesis brings out the fact that among four family groups in which there were multiple occurrences of Kartengener's triad, there were only two instances of bronchial disease in the parents. "The horizontal distribution observed, therefore, suggests an environmental factor active at the start of embryonic life, rather than a genetic factor." Still, the evidence is not conclusive and genetic factors cannot be entirely excluded. The presence of profuse nasal secretion as well as the bronchiectasis would seem to be due to a constitutional abnormality of the mucous membrane. Resected specimens, however, fail to disclose any unusual pathological features.

The authors have tabulated 80 cases previously reported, showing age of incidence and family history when available.

Bence and Bence [41] are convinced that there is a definite etiologic relationship between asthmatic bronchitis and sinus disease. Many of these cases are overlooked

39. Guerrant, J. L.; McCausland, A., and Swineford, O.: Asthma with Sinus Disease, J. Allergy **21**:187 (May) 1950.

40. Bergstrom, W. H.; Cook, C. D.; Scannell, J., and Berenberg, W.: Situs Inversus, Bronchiectasis and Sinusitis, Pediatrics **6**:573 (Oct.) 1950.

41. Bence, C., and Bence, A.: Asma y bronquitis de origen paranasal, An. cáted. pat. y clin. tuberc. **10**:106, 1948.

because of failure of cooperation among rhinologists and chest specialists, each viewing the patient only within the field of his own specialty. Also, the patient focuses his attention on the pulmonary condition and frequently disregards the nasal symptoms, which often are minimal. Frequent colds, postnasal discharge, recurring polypi, and inflamed turbinates are symptoms pointing to sinus disease. Careful analysis of x-ray findings and cultures of secretions obtained from the sinuses will lead to a correct diagnosis.

The authors treated 890 patients, of whom 310 were children. Surgery of the sinuses was resorted to in 92 of the adults. The rest were treated locally. They do not say whether any of the children were operated on. Three tables are presented, each consisting of eight cases, covering adults operated on, adults medically treated, and children. The operation performed was the transantral ethmoid operation according to the method of Ermiro de Lima. Medical treatment of the children consisted of use of vasodilators, displacement, antibiotics locally, and irrigations. All of the 24 patients listed responded favorably. The results in the remainder of the group are not given.

SINUSITIS IN CHILDREN

Macbeth [42] believes that there is a natural predisposition toward sinusitis in children which is an inherited tendency. After discussing the symptoms, the relation to lower respiratory tract diseases and diagnostic signs, he elaborates on the matter of therapy. In early cases of not too long standing, in which the pathology is reversible, he advises the displacement procedure or what he calls "postural nasal soaks." For the latter he gives the mother two bottles of lotion; one contains penicillin, 1,000 units per cubic centimeter and the other contains 10% sulfacetimide (albucid) or some other soluble sulfonamide with 1% tuaminoheptane (tuamine®) sulfate. Two teaspoons (8 cc.) of each are mixed in a receptacle and poured into the nares while the child lies with head hanging low over the bed or over the parent's lap. To avoid nasal breathing and aspiration of the fluid, a cork is placed between the teeth and the child is told to breathe through the mouth. The solution is left in for three to five minutes, after which the child turns over and expels it. If this fails after a reasonable trial, the sinus is punctured and irrigated.

In the late cases in which irreversible changes have taken place the author recommends a Caldwell-Luc operation. Sulfonamides, penicillin, ascorbic acid, and iron are given both pre- and post-operatively.

In patients who are allergic the treatment naturally is directed to the elimination of specific allergens if these can be definitely diagnosed. The author also does not hesitate to cauterize the turbinates in children and maintains that he has never seen a case of atrophic rhinitis resulting.

In general he feels that the tabu against surgery in children is unjustified and the same standards for the selection of cases should prevail as for the adult.

Wilson [43] reports a high incidence (75%) of chronic sinusitis in a group of 735 children referred to the National Children's Hospital for x-ray examination. During the same period 27% of 580 children admitted to the Steevens' and National Children's Hospital for tonsillectomy had pus or mucopus in their sinuses. Commenting on the etiology, the author mentions poor hygienic surroundings, inadequate diet,

42. Macbeth, R.: Chronic Sinusitis in Children, Irish J. M. Sc., Aug., 1950, p. 362.

43. Wilson, T. G.: Chronic Nasal Sinusitis in Children, Irish J. M. Sc., Feb., 1950, p. 83.

and exanthemata as common causes. Nasal diphtheria was found to be quite common and a great number of diphtheria carriers were seen in whom an atrophic rhinitis had resulted. Diagnosis is made on the basis of x-ray pictures and exploratory antrostomy done under general anesthesia. If pus is found, the author advises the use of frequent irrigations through an indwelling catheter. He distinguishes two common types of infection, the empyematous and the polypoid. The former usually yields to the therapy mentioned above. The latter is more obstinate because of the complicating factor of allergy, which must be evaluated and treated.

Associated diseases account for chronicity in many cases. Most frequently it is pathological conditions in the tonsils and adenoids which complicate the sinusitis. In some cases lower respiratory tract infections require attention. It is difficult in these cases to say which caused which, although more frequently the sinus infection preceded the pulmonary complication. The author, however, believes that it is safer to conclude that when both sinuses and lungs are affected, one is dealing with a "two-way traffic" in which either element may predominate.

Eliseht and Gomez [44] argue that removal of tonsils and adenoids for the cure of recurring upper respiratory tract infections is not logical unless these organs are the seat of a primary infection. Too often the operation fails to achieve the desired results because the primary seat of infection is in the sinuses and has been overlooked. Secretions draining backward from the sinuses can cause sufficient irritation of the adenoids and tonsils to cause them to hypertrophy and become secondarily infected. They therefore make a plea for more careful analysis of roentgenograms of the sinuses, with irrigation if necessary to establish the diagnosis.

Barkley [45] reviews well-known facts in connection with the anatomy, physiology, and pathology of sinusitis in children. Diagnosis and treatment are also discussed. He employs irrigation by displacement as first described by Proetz and finds it most agreeable for children because of the absence of instrumentation. Attention to general constitutional factors is also stressed.

Brown,[46] comparing the symptoms of the prerheumatic child with those observed in patients with chronic sinusitis, lists 18 which are identical. These have been culled from analysis of reports by various authors discussing both conditions. They are listed as follows: anorexia, loss of weight, nausea, mild fever, aches, fatigue, night terrors, apathy, pallor, precordial pains, nervousness, bed-wetting, frequent upper respiratory tract infections, epistaxis, and restlessness. Since most of these symptoms denote a state of toxemia, possible foci of infection must be investigated. Inasmuch as most of these children have had the tonsils and adenoids removed, and the teeth are generally in good repair, it would appear that the sinuses are the likely sources of the infection. Recognition of this fact should "afford a prophylactic approach to the problem of rheumatic fever."

Veeneklaas,[47] during 1948, found a chronic maxillary sinusitis in 80 (6%) of 1,327 children admitted to the Children's Hospital in Utrecht. In 28 patients general toxic symptoms were present, such as listlessness, irritability, and recurring fever.

44. Eliseht, G., and Gomez, R.: Infeccion sinusal en el niño, Prensa méd. argent. **37**:196 (Jan. 27) 1950.

45. Barkley, D. F.: Sinusitis in Children, Texas J. Med. **46**:107 (Feb.) 1950.

46. Brown, E. E.: Sinusitis and the Prerheumatic Child, Arch. Pediat. **67**:357 (Aug.) 1950.

47. Veeneklaas, G. M. H.: Sinusitis maxillaris chronica, Helvet. paediat. acta **5**:76 (March) 1950; Presse méd. **58**:479 (April 26) 1950.

Anemia, chronic cough, and mouth breathing were also frequent findings. Adequate x-ray studies invariably revealed definite clouding of the sinuses. The author recommends the instillation of a 1% solution of ephedrine into the nose three times daily with the child lying on its side, the affected sinus being undermost for 15 minutes, and then turning the child over to the healthy side for 30 minutes. If this fails he advises repository penicillin injections daily for one week; if this procedure fails the sinus should be punctured and irrigated with isotonic sodium chloride solution followed by penicillin instillation. In some cases the use of an autogenous vaccine proved very helpful.

Veeneklaas [48] emphasizes the close connection between sinusitis and bronchitis in children, having observed 42 cases of this kind in a period of two or three years. Twelve children who were treated and followed up to two and one-half years are reported as having shown no evidence of recurrence. Relapsing or chronic bronchitis is a common condition in childhood and often disappears at adolescence. However, a certain percentage of these pathological conditions persists and develops into bronchiectasis. Certainly every case of bronchiectasis requires a thorough study of the sinuses. In healthy children the sinuses should show up clear in the roentgenograms, and when a sinus appears cloudy it should be assumed that it is diseased. The author suggests prolonging the developing of x-ray pictures of the maxillary sinuses for more accurate appraisal.

Sacrez, Beyer, and Lagoutiere [49] found in a group of 1,046 infants less than one year of age, presenting symptoms of severe gastrointestinal derangement, that an antrum infection was present in 13.5%, as diagnosed by operation or autopsy. The incidence was much higher in the infants less than 3 months of age than in the older group. Autopsy performed in a group of 254 infants revealed antrum infection in 77 (30%). A successful antrotomy, however, failed to reduce the mortality; on the contrary, in infants less than 3 months of age the mortality was 50%. However, it is pointed out that in a large percentage of these infants the condition was complicated by other lesions. It would appear, therefore, that surgery in these cases is inadvisable, and since the advent of antibiotic therapy the results of conservative treatment have been much better.

OSTEOMYELITIS

Mangabeira-Albernaz [50] discusses the value of roentgenography in the diagnosis of osteomyelitis of the skull and concludes that the findings usually do not permit an early diagnosis. He describes the bony changes that are seen in well-defined cases, such as increased density, loss of detail, localized areas of rarefaction, and total loss of bony tissue, characterizing various stages of the process. An analysis of some 852 roentgenograms resulted in the following findings: normal calcification in 70 normal sinuses; normal calcification in 87 pathologic sinuses; irregular calcification in 155 normal sinuses, and irregular calcification in 535 pathologic sinuses.

It appears, therefore, that in 7% of normal cases a pathologic disturbance of the bone structure is present and, on the other hand, the bone structure appears normal

48. Veeneklaas, G. M. H.: Sinobronchitis, Nederl. tijdschr. geneesk. **94**:249 (Jan. 28) 1950.

49. Sacrez, R.; Beyer, P., and Lagoutiere, M.: Étude statistique des antritis du nourrisson. Pédiatrie **39**:593, 1950.

50. Mangabeira-Albernaz, P.: E possivel o diagnóstico radiográfico precoce da osteomielite frontal? Rev. brasil. oto-rino-laring. **17**:71 (May-Aug.) 1949.

in 16% of pathologic sinuses. Roentgenography, therefore, does not afford a positive early diagnosis in osteomyelitis. The author suggests the possibility of increasing the percentage of positive findings in early cases by means of planography.

MALIGNANT TUMORS

According to Opheim,[51] cancer of the nose and sinuses is responsible for 1 to 2% of all deaths from cancer in Norway. Most of the tumors are carcinomas, which may begin in the nasal cavity proper (the lateral wall usually) or any of the sinuses. They metastasize infrequently and generally only to the adjacent lymph nodes. Sarcomas, however, metastasize more frequently and usually to the lungs or bones. The author describes the progress in the average case and stresses the lack of early symptoms. The most frequent symptoms which bring the patient to the physician are external swelling, nasal obstruction, and disturbances of sensation. Later there may be sanguineous discharge with increased swelling and pain. Secondary infection of the sinus usually supervenes.

Roentgenograms can aid materially in the diagnosis. Still, a great many patients are seen too late for more than palliative therapy.

One-fourth of the 80 patients seen by the author had one or more teeth extracted because of pain. In 14 patients the secondary sinusitis was interpreted as the original complaint. One must be on the alert in such cases in which the usual therapy fails and in which bleeding occurs during the treatment.

Radical removal of the growth is possible if it is located in the basal portion of the jaw, and particularly at the anterior aspect. Extensive resection by electrocautery is recommended, with postoperative irradiation. Permanent recoveries may be expected in about one-third of all cases.

The author stresses the importance of early diagnosis, since the condition is often overlooked at the first examination. These early errors in diagnosis are responsible for the inoperable status attained by many operable tumors.

Capps [52] presents an analysis of 71 cases of malignant tumors of the nose and sinuses, 39 of which were squamous cell carcinomas, 5 adenocarcinomas, 10 unspecified carcinomas, and the rest a variety of unusual types. Most of the patients were seen late, owing perhaps to the absence of pain earlier in the disease. Nevertheless, it is fortunate that in older persons these tumors remain localized for a long time; this localization explains the surprisingly good results obtained in a fair percentage of advanced cases. Roentgenograms and planograms can be very useful in delineating the extent of the growth, and frozen sections taken at the time of operation afford excellent guides for the surgeon. Combined surgery and radiotherapy are the procedures that have proved most successful, although in the highly cellular growths, such as sarcomas, it is better to rely on irradiation. The author favors high-voltage x-ray therapy followed by diathermy excision and intracavity radium treatment. The Denker approach has proved adequate in most cases. Ligation of the carotid was not deemed necessary in most cases. As a matter of fact, it does not succeed in preventing secondary hemorrhage. Block dissection of the neck was not done, since it was felt that however radical the operation, it fails to remove the

51. Opheim, O.: Cancer of the Nose and Nasal Sinuses, Tidsskr. norske lægefor. **70**:448 (July 7) 1950.

52. Capps, F. W. C., and Williams, I. G.: Discussion on Malignant Diseases of the Nasal Cavity and Sinuses, Proc. Roy. Soc. Med. **43**:665 (Aug.) 1950.

first nodes affected, namely, the retropharyngeal group. Reliance is placed on high-voltage x-ray therapy, which in several cases has held the process in abeyance for as long as five years.

After-care is important, requiring the frequent cleansing of sloughing areas, removal of crusts, and, later, sequestrating bone. The results in 32 cases of squamous cell carcinoma showed 11 patients (34.5%) alive five years or more, and in 54 cases of carcinoma of all types, 26.9% of the patients were alive and well after five years. The author cites reports by New, Ohngren, Hanner, and others, whose results were comparable.

Dr. I. G. Williams followed Dr. Capps with a discussion of the techniques of irradiation in carcinoma of the antrum, pointing out the advantages and disadvantages. Among the latter, he describes the dry mouth due to destruction of salivary elements, bone necrosis, and damage to the ocular apparatus. The procedure he recommends is the following: (1) examination of the patient and determination of whether or not the eye should be removed; (2) preoperative x-ray therapy with the hardest ray available (million volt or teleradium); (3) operation four to six weeks later; (4) intra-antral application of radium when the sloughs have separated; (5) block dissection of the neck when indicated.

Grossman, Donnelly, and Snitman [53] used a combination of surgery and irradiation in ten cases of malignancy of the antrum. Three patients had cervical node involvement on admission, and in a fourth patient nodes developed after treatment was started. All the patients underwent preliminary external carotid ligation. Most of the growths were approached sublabially and removed or destroyed by electrosurgery. For better exposure and postoperative follow-up, a large portion of the palate was removed. Intracavitary radium was used as well as fractional x-ray irradiation externally. One case is described in detail.

Following resection of the maxilla for carcinoma, Collins and Pool [54] irradiate the exenterated cavity with radium, which is placed in the center of an acrylic mold prepared to fit the space accurately. An opening is drilled into the mold to receive the radium capsule. A brass replica of the capsule is inserted and, with the apparatus in place, its position is checked by roentgenograms taken in three projections. Thus the position of the radium capsule can be determined in advance, being placed eccentrically so as to afford maximum radiation to the area where recidivous growths might be expected and sparing the healthy areas. The mold is fixed to a modified Kingsley appliance attached to a suitable headband and left in place long enough to supply a dose of approximately 8,000 r at the periphery.

Bernier and Tiecke [55] report a case of plasmocytoma in a man of 59 who complained of nasal obstruction which had been present for seven years. There was no pain or discharge. There was a large swelling in the left anterior triangle of the neck, which the patient said had been diagnosed as a cyst 15 years previously and treated with x-rays. Nasal examination revealed a growth which looked like a polypoid middle turbinate. Roentgenograms disclosed a filling defect in the antrum.

53. Grossman, A. A.; Donnelly, W. A., and Snitman, M. F.: The Management of Malignancy of the Maxillary Sinus, Canad. M. A. J. **62**:576 (June) 1950.

54. Collins, V. P., and Pool, J. L.: Treatment of Antral Cancer by Combined Surgery and Radium Therapy, Radiology **55**:41 (July) 1950.

55. Bernier, J. L., and Tiecke, R. W.: Plasmocytoma, J. Oral Surg. **8**:70 (Jan.) 1950.

At operation, the antral face was eroded and thin. A firm mass filling the antrum was removed, as was the lining of the sinus. Sections of the mass showed hyperchromatic plasma cells with occasional "cartwheel" nuclear pattern.

Knight [56] states that there is nothing characteristic about a plasmocytoma grossly or roentgenologically and that, since there are no real criteria for differentiating the benign from the malignant, all tumors diagnosed histologically should be treated as malignant. Two patients are reported as free from recurrence after two and three years respectively. One was treated by x-rays, the other by surgery, x-rays, and radium.

The author comments on the increasing number of such cases reported in recent years and speculates as to the reason. While increase may be attributed to better observation and keener pathologic analysis, the author suggests the possibility that the increasing employment of antibiotics may be a factor, since it is known that these agents frequently inhibit or depress natural barriers to the development of neoplastic disease.

Maguda and Maiden [57] report the case of a 52-year-old Negro man with a history of nasal obstruction and bleeding. About five years previously he had had a polyp removed, which was diagnosed as a possible sarcoma. The obstruction, discharge, and bleeding recurred. Examination revealed the left side of the nose filled with a reddish, friable bleeding mass. Biopsy revealed plasmocytoma. (Photomicrographs are presented.) After preliminary treatment with intramural radon seeds, the mass was removed via a modified Moure approach. The tumor was found to be attached to and invading the turbinates, lateral nasal wall, ethmoid labyrinth, and floor of the nose. A Caldwell-Luc operation was done and the lateral nasal wall, turbinates, and ethmoid labyrinth removed. Electrocoagulation was freely employed throughout. There was no evidence of recurrence at the end of six months.

Howells and Friedmann [58] describe a case of giant cell granuloma of unknown origin in a man of 23, in which the lesions involved the nasal passages and maxillary sinuses. The diagnosis was made from nasal biopsy and examination of antrum mucosa removed during a Caldwell-Luc procedure. Symptoms of uremia appeared shortly afterward, and despite chemotherapy the patient died. Autopsy revealed widespread necrotizing vascular lesions resembling periarteritis nodosa. Bacteriological examination yielded Micrococcus pyogenes var. albus and a beta hemolytic Streptococcus. While it is possible that sulfonamides may cause a necrotizing arteritis, it is not believed to have been the factor in this case, although the exact cause of the condition could not be determined.

Fischer-Wasels [59] reports two cases of melanoma of the nose and sinuses; in one, the disease did not recur 14 months after therapy. In this case the polypoid melanomatous masses filled the antrum and ethmoids, extending into the nasal cavity and invading the lateral aspect of the nose. The tumors were removed via a Caldwell-

56. Knight, L. L.: Plasma Cell Tumors of the Paranasal Sinuses: Report of 2 Cases, J. Tennessee M. A. **43**:226 (July) 1950.

57. Maguda, T. A., and Maiden, S. D.: Plasmocytoma of the Nasal Cavity, Arch. Otolaryng. **51**:258 (Feb.) 1950.

58. Howells, G. H., and Friedmann, I.: Giant Cell Granuloma Associated with Lesions Resembling Polyarteritis Nodosa, J. Clin. Path. **3**:220, 1950.

59. Fischer-Wasels, H.: Melanom der Nase und Nebenhöhlen, Ztschr. Laryng. Rhin. Otol. **28**:584 (Dec.) 1949.

Luc operation followed by an external operation. The operation was followed by intensive irradiation with high-voltage x-rays; 7,840 r was given externally over the antrum, 4,200 r over the ethmoid, and, in addition, 3,080 r with the pointed anode in the antrum. When this failed to halt the growth the patient was given 2,000 mg.-hr. of radium (intramural), which arrested the growth although it was still present in some degree. Conceding that irradiation has in the past had but little influence on melanoma, the apparent arrest without the appearance of metastases after 14 months seemed rather encouraging.

The author describes four types of melanoma of differing histologic conformation, although possessing essentially the same highly malignant characters.

Pastore, Sahyoun, and Mandeville [60] report a case of rhabdomyosarcoma of the antrum in a man of 46, who survived without recurrence of the disease at the end of seven years. The mass developed within a few months, causing swelling of the upper jaw, nasal occlusion, and pain. At operation the tumor was found to have filled the antrum, eroding the palate as well as the other bony walls. After extensive resection, the patient received 1,000 mg.-hr. of intramural irradiation, followed by 4,000 to 6,000 r of high voltage x-rays through several portals.

The photomicrographs show a variety of cells of bizarre forms, giant cells, and mitotic figures. The cytoplasm displayed characteristic striations, both longitudinal and horizontal. The authors classify the tumor as of Grade 1 malignancy.

Smith, Latella, and Schnee [61] report a very rare case of an angiosarcoma involving the frontal and ethmoid sinuses in a man of 27. There was a history of recurring attacks of headache, nausea, vomiting, and elevated temperature over several weeks, followed by a swelling over the right frontal bone, and roentgenographic evidence of osteomyelitis. A polypoid mass seen in the nose bled freely when removal was attempted, and the biopsy showed it to be an angiofibrosarcoma. A radical operation revealed the mass invading the frontal and ethmoid sinuses, eroding into the orbit, through both anterior and posterior plates of the frontal sinus with secondary suppuration and destruction of a wide area of bone. Following surgery the patient received 3,600 r of high voltage x-ray therapy to each side, and after four years there was no evidence of recurrence. The authors refer to two extensive reports on angiosarcoma with extensive reviews of the literature.

25 E. Washington St.

(To be concluded.)

60. Pastore, P. N.; Sahyoun, P. F., and Mandeville, F. B.: Rhabdomyosarcoma of the Maxillary Antrum: Seven Year Survival Following Surgical Excision and Radiation Therapy, Arch. Otolaryng. **52**:942 (Dec.) 1950.

61. Smith, M. T.; Latella, P. D., and Schnee, I. M.: Angio-Fibrosarcoma of the Ethmoid and Frontal Sinuses Complicated by Osteomyelitis of the Frontal Bone and Epidural Abscess, Ann. Otol. Rhin. & Laryng. **59**:650 (Sept.) 1950.

Special Reports

HEARING AIDS ACCEPTED BY THE COUNCIL ON PHYSICAL MEDICINE AND REHABILITATION OF THE AMERICAN MEDICAL ASSOCIATION

As of March 1, 1952

Audicon Models 400 and 415

Mfr., National Earphone Co., Inc.
20 Shipman St.
Newark 2, N. J

Audivox Model Super 67

Mfr., Audivox, Inc.—Successor to Western Electric Hearing Aid Division
123 Worcester St.
Boston 18

Aurex Models L and M

Mfr., Aurex Corporation
1117 N. Franklin St.
Chicago 10

Beltone Symphonette Model

Beltone Mono-Pac Model M

Mfr., Beltone Hearing Aid Company
1450 W. 19th St.
Chicago 8

Cleartone Model 500

Cleartone Model 700

Cleartone Regency Model

Mfr., American Sound Products, Inc.
1303 S. Michigan Ave.
Chicago 5

Dahlberg Model D-1

Dahlberg Junior Model D-2

Mfr., The Dahlberg Company
2730 W. Lake St.
Minneapolis 16

Dysonic Model 1

Mfr., Dynamic Hearing Aids, Inc.
1042 Atlantic Ave.
Brooklyn 16

Electroear Model C

Mfr., American Earphone Co., Inc.
10 E. 43rd St.
New York 17

Gem Model V-35

Gem Model V-60

Mfr., The Gem Ear Phone Co., Inc.
50 W. 29th St.
New York 1

Maico UE Atomeer

Maico Quiet Ear Models G and H

Maico Model J

Mfr., The Maico Company, Inc.
21 N. 3rd St.
Minneapolis 1

Mears (Crystal and Magnetic) Aurophone Model 200

1947-Mears Aurophone Model 98

Mfr., Mears Radio Hearing Device Corp.
1 W. 34th St.
New York 1

Micronic Model 303

Micronic Model "Mercury"

Micronic Star Model

Mfr., Micronic Company
123 Worcester St.
Boston 18

Microtone Audiomatic T-5

Microtone Classic Model T-9

Microtone Model T-10

Microtone Model T612

Microtone Model 45

Mfr., The Microtone Company
Ford Parkway on the Mississippi
St. Paul 1

National Cub Model (C)

National Model D (Duplex)

National Standard Model (T)

National Star Model (S)

National Ultrathin Model 504

National Vanity Model 506

Mfr., National Hearing Aid Laboratories
815 S. Hill St.
Los Angeles 14

Otarion Model E-4

Otarion Models F-1, F-2, and F-3

Otarion Model G-2

Mfr., Otarion, Inc.
159 N. Dearborn St.
Chicago 1

Paravox Model D "Top-Twin-Tone"

Paravox Model J (Tiny-Myte)

Paravox Model XT ('Xtra-Thin)

Paravox Model XTS ('Xtra-Thin)

Paravox Model Y (YM, YC, and YC-7) (Veri-Small)

Mfr., Paravox, Inc.
2056 E. 4th St.
Cleveland 15

Radioear Permo-Magnetic (Multipower)

Radioear Permo-Magnetic (Uniphone)

Radioear All-Magnetic Model 55

Radioear Model 62 Starlet

Radioear Model 72

Mfr., E. A. Myers & Sons
306 Beverly Rd.
Mt. Lebanon
Pittsburgh 16
Distr., Radioear Corporation

Rochester Model R-1

Rochester Model R-2

Mfr., Rochester Acoustical Laboratories, Inc.
117 4th St., S. W.
Rochester, Minn.

Silvertone Model 103BM

Mfr., National Hearing Aid Laboratories
815 S. Hill St.
Los Angeles 14
Distr., Sears, Roebuck & Company
925 S. Homan Ave.
Chicago 7

Silvertone Model J-92

Mfr., Sears, Roebuck & Company
925 S. Homan Ave.
Chicago 7

Silvertone Model P-15

Mfr., Johnston Hearing Aid Mfg. Co.
708 W. 40th St.
Minneapolis 8
Distr., Sears, Roebuck & Company
925 S. Homan Ave.
Chicago 7

Solo-Pak Model 99

Mfr., Solo-Pak Electronics Corp.
Linden St.
Reading, Mass.

Sonotone Model 700

Sonotone Model 900

Sonotone Models 910 and 920

Sonotone Model 925

Sonotone Model 940

Sonotone Model 966

Mfr., Sonotone Corporation
Elmsford, N. Y.

Super-Fonic Hearing Aid

Mfr., American Sound Products, Inc.
1303 S. Michigan Ave.
Chicago 5

Televox Model E

Mfr., Televox Mfg. Company
1307 Sansom St.
Philadelphia 7

Telex Model 22

Telex Model 97

Telex Model 99

Telex Model 200

Telex Model 300-B

Telex Model 400

Telex Model 1700

Mfr., Telex, Inc.
Telex Park
St. Paul 1

Tonamic Model 50

Mfr., Tonamic, Inc.
12 Russell St.
Everett 49, Mass.

Tonemaster Model Royal

Tonemaster Cameo Model

Mfr., Tonemaster, Inc.
400 S. Washington St.
Peoria 2, Ill.

Unex Model A

Unex Midget Model 95

Unex Midget Model 110

Unex Models 200 and 230

Mfr., Nichols & Clark
Hathorne, Mass.

Vacolite Model J

Mfr., Vacolite Company
3003 N. Henderson St.
Dallas 6, Texas

Western Electric Models 65 and 66

Mfr., Audivox, Inc.—Successor to Western Electric Hearing Aid Division
123 Worcester St.
Boston 18

Zenith Model 75

Zenith Miniature 75

Zenith Model Royal

Zenith Model Super-Royal

Mfr., Zenith Radio Corporation
5801 W. Dickens Ave.
Chicago 39

(All the accepted hearing devices have vacuum tubes.)

Accepted hearing aids more than five years old have been omitted from this list for brevity.

TABLE HEARING AIDS

Aurex (Semi-Portable)

Mfr., Aurex Corporation
1117 N. Franklin St.
Chicago 10

Precision Table Hearing Aid

Mfr., Precision Hearing Aids
5157 W. Grand Ave.
Chicago 39

Sonotone Professional Table Set Model 50

Mfr., Sonotone Corporation
Elmsford, N. Y.

Abstracts from Current Literature

Ear

PSYCHOEDUCATIONAL STUDY OF CHILDREN BORN DEAF FOLLOWING MATERNAL RUBELLA IN PREGNANCY. E. S. LEVINE, A. M. A. Am. J. Dis. Child. **81**:627 (May) 1951.

The relation of rubella infection during early pregnancy to various congenital defects in the infant—notably acoustic defects—has been confirmed by reports from various workers throughout the world. It was considered timely to investigate the psychoeducational patterns of children born deaf after rubella in the mother during pregnancy. This paper, accordingly, is based on a study of the behavior, intelligence, school achievement, acoustic patterns, and general health of 16 such children in their first two years of school life. Their ages at the time of school admission ranged from 3 years to 4 years 10 months.

In all cases rubella had been contracted by the mother within the first three months of pregnancy. Other physical defects present among the children included ocular defects, systolic murmur, cervical adenitis, umbilical hernia, pigeon breast, enlarged spleen, aphagia, digestive disorder, and cryptorchism.

In regard to behavior, 13 of the 16 children behaved much the same as the other inmates at the school for the deaf, except for their greater tendency to hyperactivity, tenseness, and low stimulus threshold. In the other three children, however, the behavior was strongly suggestive of cerebral damage or disease, combining infantile characteristics, defective mentality, inappropriate responsiveness, and queer mannerisms.

Intelligence testing of the 13 children to whom such tests could be successfully administered disclosed a range from borderline through superior, and their school progress was in accordance with their respective mental capacities. The three seriously affected children could not be tested successfully. At the end of a special two-year class project it was decided that they were uneducable, and institutional care was recommended.

From the evidence of this study, it appears that deaf children with a maternal history of rubella during pregnancy fall into two main classes, educationally considered: (1) those who are educable and in whom the major developmental handicap is deafness, and (2) those who are uneducable and in whom the developmental handicaps are deafness, mental defects, and behavioral peculiarities suggestive of cerebral damage. The evidence further indicates that developmental peculiarities make themselves apparent as far back as early infancy. In such case it is wise to prepare the parents for the possibility of institutionalization of the child. For the same reason, the association between congenital defects and maternal rubella during pregnancy should be given wide publicity in order that parents and children both may be protected against this relatively mild illness, which may, nevertheless, have such serious consequences.

ALPERS, Philadelphia [A. M. A. AM. J. DIS. CHILD.].

PENICILLIN THERAPY OF OCCULT MASTOIDITIS WITH ACUTE DIGESTIVE DISTURBANCE. K. WEISSE, Ztschr. Kinderh. **66**:121, 1948.

Infants with occult mastoiditis following acute infections, characterized by rapid loss of weight, vomiting and diarrhea, and toxic appearance were commonly treated by operation. The author treated eight patients with the aforementioned symptoms and the clinical diagnosis of mastoiditis with penicillin and effected a rapid recovery of the patients. The author bases the diagnosis on the above symptoms and her clinical experience with 46 previously reported cases (*Ztschr. Kinderh.* **65**:4, 1948) in which either surgery or autopsy confirmed the diagnosis of mastoiditis in 41 of the cases.

GLASER, Chicago [A. M. A. AM. J. DIS. CHILD.].

EFFECT OF HIGH FREQUENCY SOUND WAVES UPON THE VESTIBULAR APPARATUS. E. VYSLONZIL, Wien. med. Wchnschr. **61**:468 (July 29) 1949.

On the basis of animal experiments, the author concludes that by varying the intensity of the sound waves it is possible to produce effects ranging from mild impairment to complete abolition of function of the vestibular apparatus. Very small doses sufficient to dampen the vestibular irritability do not affect the equilibrium and do not produce histologic changes except for mild hyperemia. In more intense experiments the maintenance of equilibrium may be rendered impossible without the animal's being affected in any other way, so that follow-up studies over a period of months are possible. In these cases changes in the nerve tissue, as well as marked chronic hyperemia, are present.

MASON, New York [A. M. A. AM. J. DIS. CHILD.].

STUDIES OF WAR DEAFNESS. URPO SIIRALA, Acta otolaryng. **38**:318 (Aug.) 1950.

Ear injuries to the Finnish army in the war periods 1939 to 1940 and 1941 to 1944 are presented. These occurred in over 1,000 cases. They were grouped according to the type of injury: acoustic trauma, blast, various fragments and blunt trauma, alone or in combination. Acoustic trauma caused chiefly inner ear injury. Blast usually caused middle ear injury. Bilateral complete hearing loss was rare in trauma cases but unilateral complete loss of hearing occurred in about 25% of the trauma cases. Wounds and blunt trauma averaged the greatest damage to hearing. Blast affected the opposing ear markedly. Other types of injury were more usually unilateral. Otitis media and canal and facial nerve injuries were not uncommon. Two-thirds of the wounds involved the skull and brain. One-third involved only soft tissues. Drum lesions varied with the power of the blast to which the soldiers were exposed.

ROBERT LEWY, Chicago.

CALORIC TEST OF INNER EAR. H. INO, and T. HAYAKAWA, Jap. J. Otolaryng. **23**:367 (Sept.) 1951.

The authors experimented with from 5 cc. to 50 cc. of water at a temperature varying from 15 C. to 30 C. on 50 healthy persons whose eyes fixed straight ahead to 15° and 45°. They were concerned with the relation of nystagmus to (1) temperature and quantity of the irrigating fluid, (2) the position of the head during the examination, (3) the time interval until the irrigation is repeated, and (4) the position of the eyes.

They obtained the most satisfactory results when the test was carried out while the patient was placed in a recumbent position with his head supported by a pillow, at about 60° and the eye on the tested side fixed on a point 15° away from the center. Then 20 cc. of water at the temperature of 30 C. was slowly introduced. They waited ten minutes before the second test was performed on the same ear. The average duration of nystagmus was approximately 100 sec.

HARA, Los Angeles.

CARCINOMA OF EXTERNAL EAR. T. HARADA, Jap. J. Otolaryng. **23**:371 (Sept.) 1951.

Harada records a case of epithelioma of the right external auditory canal in a woman aged 62. The patient has had a chronically discharging ear since her childhood. The tumor appeared as a small growth deep in the external canal seven years before the patient consulted the author. The operation showed that the tumor had originated on the posterior wall and had invaded the middle ear cavity.

After surgery the patient received penicillin and radium irradiation, but there was recurrence of the tumor, complicated with facial palsy and profuse otorrhea, and the patient died two months after the surgery.

Harada reviews the Japanese literature on carcinoma of the ear (exclusive of the concha) and cites 31 cases in men and 30 cases in women, the youngest being 20 and the oldest 75 years of age. These included 38 cases of epithelioma, 3 of adenocarcinoma, 2 of basal cell carcinoma, 2 of carcinoma simplex, 1 each of columnar cell carcinoma and myxoma, and 14 unclassified.

HARA, Los Angeles.

Pharynx

BACILLUS PROTEUS ABSCESS OF CEREBELLAR LOBE OF OTOGENIC ORIGIN. W. R. CHAMBERS and W. CLARK, A. M. A. Arch. Otolaryng. **54**:179 (Aug.) 1951.

Chambers and Clark report the case of a boy aged 16 with cerebellar abscess and subdural abscess in the posterior fossa, of otogenic character and due to a Proteus vulgaris infection. Cerebellar abscess from this source is rare, as is any brain abscess due to this infectious agent. In either of these circumstances prognosis has been poor in the past.

The patient was subjected to three operations and was discharged after 78 days in the hospital, having received 53.5 gm. of streptomycin, as well as 17,350,000 units of penicillin, 2,000 mg. of aureomycin, 55,750 mg. of chloramphenicol, 3.5 gm. of sulfadiazine, and 4 gm. of eskadiazine® (a 10% [W/V] aqueous solution of microcrystalline sulfadiazine). Two months after discharge he was able to ride a bicycle without difficulty, and all his residual neurological signs had improved. ALPERS, Philadelphia [A. M. A. ARCH. NEUROL. & PSYCHIAT.].

INTRAVENOUS PROCAINE FOLLOWING TONSILLECTOMY. K. SOMERS, Ann. Otol. Rhin. & Laryng. **60**:175 (March) 1951.

Inasmuch as good results have been reported when a dilute solution of procaine hydrochloride is given intravenously for the treatment of a variety of traumatic and painful conditions, the author utilized this preparation in an attempt to relieve post-tonsillectomy pain. A discussion of the mode of action and probable safe therapeutic intravenous dosage of procaine hydrochloride is presented.

Forty-one patients were given intravenous procaine injections the day after tonsillectomy. The first group of 18 patients received 10 cc. of a 1% solution, while the second group of 20 patients received 10 cc. of a 2% solution and a third group of 3 patients were given 20 cc. of a 2% solution. All injections were administered within a five-minute period. In the first group, analgesia of the tonsil fossae lasted for an average of two hours, while patients in the second group experienced analgesia for about four hours and those in the third group nine and one-half hours. A fairly high blood level of procaine hydrochloride was demonstrated in five of the patients 15 minutes after the intravenous injection.

Unpleasant symptoms experienced by patients during injection precluded the use of the drug in routine post-tonsillectomy care. STEELE, Kansas City, Kan.

TONSILLECTOMY IN THE ALLERGIC CHILD. BEN F. FEINGOLD, California Med. **71**:341 (Nov.) 1949.

Edema is the chief factor in enlargement of tonsils of children with allergic disease.

In the absence of infection, tonsillectomy and adenoidectomy are contraindicated in the allergic child, except when obstruction is present.

Infection produces one of two distinct patterns when it influences allergic states, the pattern depending upon the nature of the infectious disease. Chronic infection of the upper respiratory tract in the allergic child produces a pattern simulating that of acute respiratory infection. If, in the presence of infected tonsils and adenoids, management of the allergic state does not produce results, tonsillectomy and adenoidectomy are indicated. Management of the allergic disease must be continued postoperatively.

Whether infection is present or absent, allergic disease can be controlled only through competent management of it. PRYOR, Redwood City, Calif. [A. M. A. AM. J. DIS. CHILD.].

AN EVALUATION OF RADIUM TREATMENT TO THE NASOPHARYNX IN ASTHMATIC CHILDREN. VICTOR L. COHEN and WILBUR J. FISHER, J. Allergy **20**:328 (Sept.) 1949.

The authors studied 15 patients ranging in age from 4 to 16 years. All had perennial asthma and had skin reactions positive to various antigens.

The nasopharynx was exposed to 100 mg. of radium for six and one-half minutes. Four treatments at intervals of 21 days were given.

The authors feel that radium treatment to the nasopharynx is not a panacea for any type of asthma, but that it should be considered as an auxiliary to other forms of treatment.

It would appear that better results might be anticipated in a case with an increased sedimentation rate, normal sinuses, and little or no adenoid tissue in the nasopharynx.

HOYER, Cincinnati [A. M. A. ARCH. NEUROL. & PSYCHIAT.].

TUBERCULOSIS OF TONSILS. BANHIDY FERENC, Paediat. danub. **6**:171 (Sept.) 1949.

Removed tonsils and adenoids of 300 children between the ages of 3 and 16 years were examined for evidences of tuberculosis. Microscopic examination revealed tuberculous changes in 28 tonsils (8.4%) and 12 adenoids (4%). There are no symptoms which would definitely point to tuberculosis of the tonsils. Certain signs might, however, be characteristic of the condition, and these are discussed in detail. After removal of the diseased tonsils spread of tuberculosis was never observed, and recovery was uneventful in all cases.

FROM THE AUTHOR'S SUMMARY [A. M. A. AM. J. DIS. CHILD.].

TONSIL PROBLEM IN CHILDREN. K. BERG, Nord. med. **37**:633 (March 27) 1948.

A follow-up study was made on the state of health of 1,717 children on whom tonsillectomy had been performed during a 10-year period. In nonallergic children with recurring tonsillitis the effect of the operation had been very good, most of them being rid of their troubles. Considerable improvement was also found in children with frequent chills accompanied by cough and sneezing. The improvement applies to the first few years; the later results were less satisfactory. In the allergic children the results were not satisfactory; a great many of them did not show any improvement at all. In children with recurring otitis there had been obvious benefit from the operation, but adenotomy would probably have been just as useful. The relation between the tonsils and some of the common epidemic diseases was investigated, and it was found that scarlet fever incidence is markedly reduced in children who have had their tonsils removed as compared with children who still have their tonsils. In other specific infections there was no such effect.

WALLGREN, Stockholm, Sweden [A. M. A. AM. J. DIS. CHILD.].

Larynx

SYMPOSIUM ON CARCINOMA OF THE LARYNX: 1. SURGICAL TREATMENT OF EARLY CARCINOMA OF THE LARYNX. FRANCIS E. LEJEUNE. 2. TREATMENT OF EXTENSIVE CARCINOMA OF THE LARYNX. HENRY B. ORTON. 3. ROENTGEN THERAPY OF CARCINOMA OF THE ENDOLARYNX. J. A. DEL REGATO. 4. CANCER OF THE LARYNX: FIVE YEAR RESULTS. LEROY A. ACHALL. 5. SUMMARY OF CANCER OF THE LARYNX SYMPOSIUM. GORDON B. NEW, Laryngoscope **61**:488 (June) 1951.

This symposium on carcinoma of the larynx presents from various viewpoints the treatment of early and late disease, by surgery and by x-rays. Five year results are discussed and a summary of the symposium included.

HITSCHLER, Philadelphia.

EXCISION OF EXTENSIVE LYE STRICTURES OF ESOPHAGUS. PAINE, J. R., New York J. Med. **51**:2628 (Nov. 15) 1951.

Paine remarks that dilation of strictures may seem to be interminable and unsatisfactory, but not until quite recently did surgery offer good results. He reports two patients, aged 5 and 9, in whom he excised the strictures, and joined the stomach to the proximal end of the esophagus. The first operation required five and a half hours and 750 cc. of blood and called for freeing of both stomach and esophagus, resection of the stricture, drawing up of the stomach into the right chest to the level of the aortic arch, and anastomosis with the anterior wall of the stomach. After 16 months "she can eat all types of food." In the second case, using a similar technique, anastomosis was done at the level of the second thoracic vertebra. Paine emphasizes the cost of treatments previous to surgery. In the first case it was $3,815.90, and in the second $5,714.99. Since few families can bear such a burden, taxpayers must meet the bill. By contrast, surgery

at the proper time cuts this expense greatly. Complications which are regarded as unimportant are regurgitation of food for a short time only and competition of lung and stomach for spatial movements. "The American literature contains reports of 16 other excisions of extensive inflammatory strictures with only one death, and satisfactory results in the surviving 15 patients."

It should be mentioned that Chevalier Jackson many years ago publicized strictures from lye swallowing and succeeded after almost interminable efforts in securing legislation demanding "poison" labels on all packages of lye, with antidotes to be used immediately. He also advised that all such articles be kept out of the reach of children.

VOORHEES, New York.

GLOSSOPHARYNGEAL NEURALGIA AND TUBERCULOUS LARYNGITIS: RECOVERY WITH STREPTOMYCIN. J. C. REY and E. CANEPA, Prensa méd. argent. **38**:1694 (July) 1951.

A man aged 55 with pulmonary tuberculosis had onset of attacks of what was considered idiopathic glossopharyngeal neuralgia. The attacks were severe, coming on five or six times a day. Between them he had a sensation of dryness in the mouth.

At first an otolaryngologic examination revealed no cause for the syndrome, and a diagnosis of glossopharyngeal neuralgia was made. A lumbar puncture showed no abnormality, and the amount of total protein was normal; there was only 1 cell per cubic millimeter of cerebrospinal fluid. The results of bacteriologic and serologic studies were normal. Another laryngoscopic examination revealed tuberculous laryngitis. The glossopharyngeal neuralgia cleared up completely after a course of streptomycin therapy. The authors know of no other case, in their own experience or in the literature, in which there was such a close relation between glossopharyngeal neuralgia and tuberculous laryngitis.

SAVITSKY, New York [A. M. A. ARCH. NEUROL. & PSYCHIAT.].

POSTCRICOID CANCER. H. IWAMOTO, Jap. J. Otolaryngology **23**:359 (Sept.) 1951.

Postcricoid carcinoma is often treated as upper esophageal carcinoma, and its true nature unrecognized. In Japan very little attention has been given to it. The author reports two cases of this type of neoplasm occurring in men aged 66 and 55. Total laryngectomy was performed on both patients, but both died because of the late stage of the disease. He believes the growth in this region is highly malignant, with a great tendency for early metastasis to cervical and mediasternal spread. He urges an early recognition and proper surgical intervention to bring about complete irradication of the disease process.

HARA, Los Angeles.

Nose

RACIAL INCIDENCE (CHINESE) OF NASOPHARYNGEAL CANCER. H. MARTIN, and S. QUAN, Ann. Otol. Rhin. & Laryng. **60**:168 (March) 1951.

Martin and Quan have noted a marked racial disposition to cancer of the nasopharynx in Chinese patients admitted to Memorial Hospital Clinic in New York City during the 15-year period 1935 to 1950. There is suggestive evidence that this susceptibility is shared to some extent by all Oriental races except the Japanese, in which there is no statistical evidence of such a tendency so far. An excellent review of the literature on the subject is presented.

In 45 cases cancer of the upper respiratory and alimentary tracts was observed in Chinese during the 15-year period. Of these, 37 (82.2%) showed cancer of the nasopharynx as compared with an expected incidence of 5.5% based on the over-all (mainly Caucasian) incidence in the Memorial Hospital. The incidence of cancer in anatomic sites other than the nasopharynx appears to be about the same for Chinese and other Orientals as for Caucasians.

STEELE, Kansas City, Kan.

CARCINOMA OCCURRING IN AN ANTROALVEOLAR FISTULA. F. T. HILL, and I. I. GOODOF, Ann. Otol. Rhin., & Laryng. **60**:238 (March) 1951.

A case of carcinoma occurring in an antroalveolar fistula after dental extraction and associated with chronic maxillary sinusitis is reported. The patient was found to have epidermoid carci-

noma, Grade 3, on biopsy and in exploratory antral surgery, as well as carcinoma in the cervical lymphatics.

While it is not unusual for chronic sinusitis to develop malignant changes, the authors are not aware of any reported similar changes taking place in an antroalveolar fistula. It is believed that the existence of a chronic inflammatory process such as usually is present in antroalveolar fistula might play a part in the development of malignant change. Therefore, the case illustrates the necessity for early correction of such fistulae.

STEELE, Kansas City, Kan.

RECONSTRUCTION OF UNDERDEVELOPED PREMAXILLA IN CONJUNCTION WITH NASAL DEFORMITY. S. KAPLAN, Eye, Ear, Nose and Throat Month. **30**:370 (July) 1951.

Kaplan emphasizes the need to correct an underdeveloped premaxilla whenever it occurs together with nasal deformity, in order to secure satisfactory corrective results. After the rhinoplasty, Kaplan introduces a horseshoe graft of suitable size into the upper lip in front of the maxillary spine. The grafts used successfully have been of preserved costal cartilage, sculptured to fit over the premaxiila. The incision between the septum and the columella is extended a little to each side of the maxillary spine, and a pocket is made in the upper lip from cuspid to cuspid. A graft formed of two parts, the halves being joined by chromic sutures, has been found easier to introduce than a single-piece graft, since the suture can be left loose during introduction and drawn firmly and tied after the graft is settled into the bed. The incision between the columella and the septum is finally closed with two or more 0000 silk sutures.

SELTZER, Philadelphia.

EXPANDING TUMORS OF MAXILLARY SINUS: VALUE OF LATERAL RHINOTOMY. C. A. HEATLY, New York J. Med. **51**:2640 (Nov. 15) 1951.

Progressive swelling of the facial contour of one side is one of the first signs of internal expansion. Most conditions are malignant tumors of the antrum or ethmoid, but a few are benign. In either instance, surgery is the treatment of choice. Symptoms are pain in the upper teeth and jaw, nasal discharge, epistaxis, and lacrimation. X-ray studies show bone necrosis in at least 83%. Biopsy is the ultimate decisive factor in diagnosis. Surgery, especially electrosurgery, is, of course, the best choice, followed by irradiation, according to the surgeon's judgment. The approach may be transantral or external, following the lines of incision set down by Moure or Fergusson. In Heatly's opinion, wide exposure, and therefore complete removal, can be obtained only by lateral rhinotomy. He uses thiopental (pentothal®) sodium intravenously and ligates the external carotid. Five case reports exemplify the desirability of biopsy, exploration, and complete exposure of the entire internal superior maxilla. Pathologically, the microscope showed a fibroma, an adamantinoma, fibrosarcoma, plasmacytoma, and epidermoid carcinoma. Heatly says that "Careful closure results in surprisingly little visible scarring or facial deformity." He says nothing about subsequent plastic surgery or restoration of defects through prostheses, but this is accepted practice, as everyone knows. Three figures illustrate the lines for incisions and the gross and microscopic appearances.

VOORHEES, New York.

MODERN CONCEPTS IN RHINOPLASTIC SURGERY. W. A. MARMOR, Urol. & Cutan. Rev. **55**:209 (April) 1951.

This paper is in general in the form of an essay, reviewing the progress of rhinoplasty, since its modern beginnings, when Joseph first operated in 1907, introducing his method of intranasal incision. Progress has been hastened by the use of local anesthesia and the introduction of antibiotics, with their reduction of the dangers of infection. The importance of cosmetic rhinoplasty has been recognized, in addition to surgery for intranasal abnormalities. This step has led to the recognition of emotional disturbance arising from peculiarities of the external nose, whether racial, congenital, or traumatic. This factor has both economic and social significance for the individual. The most recent indications for cosmetic rhinoplasty have arisen since the advent of television.

SELTZER, Philadelphia.

Miscellaneous

RECONSTRUCTIVE SURGERY OF THE LIP. W. S. FLANAGAN, Am. Surgeon **17**:737 (Aug.) 1951.

In this article the author is concerned chiefly with the results of injuries and scars, particularly about the mouth. In some cases, however, the nose is involved, as in the presence of malignant growth at the nasolabial angle and of cleft palate and lip. In these instances reconstruction includes also rhinoplastic procedure. In correcting cleft lip and palate, the author's method is to advance the lip upon the columella so that the tip of the nose is projected forward to give it a more normal contour. A full-thickness flap from the lower lip is rotated 180 degrees and left so attached that the inferior labial artery will still function. After excision of the scar tissue about the cleft in the upper lip, the flap is sutured into the operative field. After about two weeks, the pedicle of the flap is cut through and the wound edges are closed.

SELTZER, Philadelphia.

THE DIAGNOSIS AND TREATMENT OF MENINGITIS. WILLIAM J. KERR JR. and EDWARD B. SHAW, California Med. **73**:325 (Oct.) 1950.

Treatment of patients with meningitis no longer consists in administration of antimeningococcal serum and awaiting the results. Today there is at hand an ever-expanding armamentarium of drugs effective on various bacteria, rickettsia, and some of the larger viruses. The skillful use of these singly or in combination offers an excellent prognosis in most forms of bacterial meningitis. Tuberculous meningitis continues to present a poor outlook, but this has been improved with more intensive therapy. More effective agents are needed in the treatment of this disease.

"Shotgun" therapy may be indicated in critically ill patients prior to accurate bacteriological diagnosis; it is more important, however, that therapy should include an effective agent or combination of agents than that an attempt be made to determine in advance the most potent form of specific therapy. Partially treated purulent meningitis may be confused with aseptic meningitis. There is at present no effective therapeutic agent for the viral meningitides, but the prognosis is favorable in most of these diseases without specific therapy.

PRYOR, Redwood City, Calif. [A. M. A. AM. J. DIS. CHILD.].

DEVELOPMENT OF TOLERANCE TO ANTIHISTAMINES. T. B. DANNENBERG, and S. M. FEINBERG, J. Allergy **22**:330 (July) 1951.

Failure or diminished effectiveness of various antihistamine drugs to reduce the wheal response to histamine and ragweed extract was interpreted as evidence of acquired tolerance on the part of the patients studied in this report. The time necessary for tolerance to develop varied from 7 to 20 days of maintenance on therapeutic doses of the antihistamine drug. Tolerance developed to one antihistamine drug extended to others, even though the chemical relationship was not close. The return of response after discontinuance of the drug requires from 3 to 14 days. The authors, however, believe that clinically this development of tolerance is only relative and that most patients continue to derive symptomatic relief from prolonged antihistaminic therapy. When development of clinical tolerance is suspected, the dosage of an antihistamine drug should be increased or use of the drug discontinued for 3 to 14 days before treatment is resumed.

FRIEDBERG, Chicago.

TUBERCULOUS MENINGITIS. H. CAIRNS, H. V. SMITH, and R. L. VOLLUM, J. A. M. A. **144**:92 (Sept. 9) 1950.

Recovery from tuberculous meningitis with the aid of chemotherapy is a slow process, requiring a year or more, as might be expected from the behavior of tuberculosis of other parts of the body. Streptomycin must be given to the patient for a long period, and treatment with the drug should be followed by rest and graduated exercise and on sanatorium lines.

Cairns and his colleagues have treated 93 patients with tuberculous meningitis with streptomycin. For the first 60 of these patients the recovery rate was 50%. The majority of deaths occurred in the first three months; the relapse rate after a full course of treatment was low, 4 in 60. The authors have administered streptomycin for a much longer period than have most

other workers in this field, and they hold the view that the course of the disease under treatment has justified their policy. As with tuberculosis in other parts of the body, in the meninges the inflammation is exceedingly slow to subside, even in the most favorable case; although at the end of 6 months of streptomycin therapy the cells and protein of the cerebrospinal fluid are usually approaching normal, it may take an additional 6 to 12 months before they are finally within normal limits, the protein level usually being the last to fall.

It is difficult to lay down precise rules for stopping treatment. The authors state that intrathecal injections should be continued daily for at least eight weeks after the last positive films or cultures, until cerebrospinal fluid studies show that the cell fluctuations have disappeared and the protein level is stationary or falling, until there is no clinical evidence of active disease, and, in particular, until the weight has ceased to diminish. Streptomycin intramuscularly administered should be continued for at least 180 days, regardless of the patient's progress. Its administration should not be stopped until the patient is gaining weight and the protein level and cell count of the cerebrospinal fluid have been steadily falling for at least two months.

All the authors' patients were treated in centers with facilities for minor neurosurgical operations. In spite of great care with the daily lumbar puncture, the spinal subarachnoid space became partly or completely blocked at some stage of the illness in about one-third of the patients. Bifrontal burr holes were immediately made, and the streptomycin was injected into the ventricles, or occasionally into the cisterna magna, until the lumbar subarachnoid space reopened. There should never be a day during treatment when the therapist does not have free access to the cerebrospinal pathways for giving streptomycin or for withdrawing cerebrospinal fluid to relieve increase of intracranial pressure.

Preliminary experiences with intrathecally injected tuberculin (purified protein derivative) have been encouraging from the therapeutic standpoint. The authors suggest these indicate that this substance results in a lysis of the exudate, and that in these circumstances streptomycin is a better remedy for tuberculous meningitis than has hitherto been supposed. Intrathecal use of tuberculin is being cautiously extended to a larger series of patients.

ALPERS, Philadelphia [A. M. A. ARCH. NEUROL. & PSYCHIAT.].

AEROSOL THERAPY: VACUUM CLEANER AS PRACTICAL SOURCE OF POSITIVE PRESSURE FOR NEBULIZATION. J. M. SHELDON, R. G. LOVELL, and K. P. MATHEWS, J. A. M. A. **146**:648 (June 16) 1951.

Aerosol therapy employing antibiotics, bronchial dilators, and sympathomimetic amines is widely used, but long treatment is required. The authors have outlined a method whereby aerosolization can be carried out in the patient's home using most of the modern models of vacuum cleaner.

If too strong a concentration of penicillin is used for a long period, sore throat or irritation may result. They have found that penicillin when given by aerosol should be made from crystalline penicillin and should be administered in concentration usually no greater than 20,000 units per cc.

GORDON, Philadelphia.

THE PROGNOSIS OF FACIAL NERVE PARALYSIS IN POLIOMYELITIS. HENRY RASCOFF, J. Pediat. **35**:567 (NOV.) 1949.

Rascoff observed 23 children with facial paralysis due to poliomyelitis. Nineteen of these children had no other nerve involvement. Twelve children recovered completely, 10 children showed slight permanent paralysis, and 1 child retained a marked permanent paralysis. Treatment did not seem to alter the course of the disease.

MACDONALD, Pittsburgh [A. M. A. AM. J. DIS. CHILD.].

NUTRITION AND THE EYE, EAR, NOSE AND THROAT, WITH EXCERPTS FROM THE LITERATURE. ISAAC H. JONES, HAROLD S. MUCKLESTON, EUGENE R. LEWIS, and GILBERT ROY OWEN, Laryngoscope **60**:1210 (Dec.) 1950.

In the usual diet the main lack of vitamin intake is in vitamin B, but other vitamins and minerals may be lacking too. One of the reasons is our use of white flour and white sugar.

Pasteurization of milk renders it nearly valueless as a source of calcium. Citrus fruits and vegetables are plentiful in vitamin C only if they are fresh. Some leafy vegetables lose all their vitamin C in one week. Experiments on cats show that raw meat and milk are far better foods than the cooked products. Many diseases may be attributable to a faulty diet.

HITSCHLER, Philadelphia.

PRACTICAL PROBLEMS IN THE USE OF CORTISONE AND ACTH. JOSEPH LEE HOLLANDER, Laryngoscope **61**:565 (June) 1951.

Cortisone and corticotropin (ACTH) are powerful, dangerous, and costly drugs. As Hollander says, "they help many conditions but cure none." There are many possible severe reactions or complications to their use. They do help (temporarily) several otolaryngological conditions, but the use of such potent drugs in most of those cases is like "driving a tack with a sledge hammer." Extreme caution is urged in their use.

HITSCHLER, Philadelphia.

NASAL AND CUTANEOUS ALLERGY TO CORTISONE. DAVID BERNSTEIN, New York J. Med. **51**:1849 (Aug.) 1951.

A 40-year-old woman had suffered from nasal obstruction for 15 years. The diagnosis was vasomotor rhinitis, but she responded to none of the procedures in common use. The nasal sinuses showed thickened membrane, but irrigation fluids were clear. Four months later she experienced a severe nasal hemorrhage following severe sneezing. When she was admitted to the University Hospital (Bellevue) the bleeding was controlled by cautery and packing with oxidized cellulose. When she became ambulatory, cortisone was suggested and accepted. One hundred milligrams was given intramuscularly. Within five minutes there was complete nasal obstruction, giant urticaria, edema of the cheeks and eyelids, and great feeling of apprehension. One cubic centimeter of epinephrine (1:500) in oil was given into the muscles with fairly prompt relief. At home she was instructed to take 150 mg. of diphenhydramine (benadryl®) hydrochloride with 50 to 300 mg. of tripelennamine (pyribenzamine®) hydrochloride during 24 hours. She was improved the following day and wished to try cortisone again. Fifty milligrams was given into the muscles and again she had a similar reaction within five minutes, although this reaction was milder than the first. The response to 1 cc. of epinephrine in oil was effective. No further experiment with cortisone or corticotropin has been tried.

I. W. VOORHEES, New York.

CONGENITAL ANOMALIES OF ESOPHAGUS. WILLIAM E. LADD, Pediatrics **6**:9 (July) 1950.

Congenital esophageal atresia, esophageal stricture, esophageal duplications, tracheoesophageal fistula, and their variations are considered in this paper. The improvement which has taken place in the last 10 years in the treatment of surviving patients with esophageal atresia is mentioned. The methods used to effect this improvement are discussed, and suggestions are made for the improvement of children's surgery in general.

The purpose of the paper has not been to present a complete treatise on congenital anomalies of the esophagus, and many details are intentionally omitted. The author's endeavor has been to use this article as a vehicle for suggestions of some of the difficulties encountered in children's surgery, and of some of the methods used to overcome them, as well as to urge the American Academy of Pediatrics to help raise the standard of children's surgery. It is Ladd's conviction that the Academy can do much to accomplish this if it wishes. It is his hope that the Academy will feel that the surgical problems of early life are related to the general welfare of children, and as such are of moment to it. He believes that the time is now ripe to recognize this.

Men who are devoting their full time to the advancement of child surgery can be found in a few medical schools in the east, midwest, and far west. The Academy could do much in advocating that full-time research become a more widespread policy. The establishment of departments of child surgery in the medical schools of the country seems the next logical step for raising the standards of child surgery.

FROM THE AUTHOR'S SUMMARY [A. M. A. AM. J. DIS. CHILD.].

PATHOGENESIS OF BRONCHIECTASIS. FELIX G. FLEISCHNER, Radiology **53**:818 (Dec.) 1949.

The author has furnished several graphic examples explaining the nature of bronchiectasis in various phases. Many cases considered bronchiectasis represented extensive areas of destruction as occur in abscesses and therefore were not truly bronchiectasis. The importance of atelectasis and the transient character of early bronchiectasis were recognized. In contrast to the normal bronchograms, there was nonfilling of the peripheral branches, which indicated either obstruction or impaired ventilation of the parenchyma surrounding the dilated bronchus, giving the picture of the "leafless tree" without exception. Organizing pneumonitis made permanent a mechanical disturbance similar to fibrosis, with shrinkage as in atelectasis, causing an early reversible atelectatic collapse to become a permanent crippling condition. Areas of consolidation or emphysema, if suitably distributed, cause an increased external dilating pull upon the bronchi.

ANSPACH, Chicago [A. M. A. AM. J. DIS. CHILD.].

PAROTID TUMORS: HISTOPATHOLOGY, CLINICAL BEHAVIOR, AND END-RESULTS. J. W. KIRKLIN, J. R. MCDONALD, S. W. HARRINGTON, and G. B. NEW, Surg., Gynec. & Obst. **92**:721 (June) 1951.

This article is a review of 717 cases of parotid tumor seen at the Mayo Clinic. The clinical and pathological features are discussed and the authors have given their own histopathologic classification of this group of tumors.

Mixed tumors have a tendency to be of rubbery consistency or even cystic and occasionally hard. Carcinomas and sarcomas have a greater tendency to be firm and to become fixed to the surrounding structures. Pain in the region of the tumor is suggestive of a serious type of lesion. The most important fact concerned with the clinical evaluation of patients with parotid tumors is that there is no single feature, or combination of features, which allows identification of the type of tumor in any given case.

The authors believe that primary mixed tumors are best treated by complete excision but do not feel that this must necessarily involve subtotal or total parotidectomy. They treat carcinomas of the parotid gland by radical excision combined with radical dissection of the nodes and node-bearing fascia of the neck on the involved side.

The surgical pathologist carries a heavy responsibility in the management of patients with parotid tumors. Fresh frozen sections at the time of operation are essential, and the surgeon must be prepared to interpret the histopathologic diagnosis and must recognize the indications for the various surgical procedures available.

FRIEDBERG, Chicago.

POSTEMETIC RUPTURE OF THE ESOPHAGUS. P. C. SAMSON, Surg., Gynec. & Obst. **93**:221 (Aug.) 1951.

This report concerns the history of two patients who experienced postemetic rupture of the esophagus. The diagnosis was made, the patients underwent surgery, and they recovered completely. The author considers that the term "spontaneous perforation" of the esophagus is a misnomer and that when there is no preexisting esophageal disease the term "rupture," implying the application of force, is more appropriate and the lesion should be considered of traumatic rather than of spontaneous origin. Experimentally, the esophagus will rupture just above the diaphragm if sufficient pressure is applied from within. The author feels that such pressures may be frequently exceeded during the active vomiting.

Postemetic rupture of the esophagus must be differentiated from perforated peptic ulcer, acute pancreatitis, empyema of the gall bladder, acute coronary occlusion and spontaneous pneumothorax. If the lesion is kept in mind, the symptoms become practically pathognomonic. There is usually a history of overuse of alcohol followed by vomiting of blood-streaked material, severe substernal and epigastric pain, and great physical deterioration within a few hours. Severe pain, restlessness, and board-like abdominal rigidity are evident, along with dyspnea, cyanosis, and crepitus in the neck. Diagnosis must begin immediately, and a small swallow of iodized oil (never barium) will soon localize the esophageal tear.

The direct exposure by thoracotomy with definitive repair of the rupture as soon as possible is necessary for a successful outcome. If this is done within 15 hours, most patients recover

Meanwhile resuscitation, blood transfusions, antibiotics, and supportive measures are essential. If, by rare chance, the patient survives the original contamination for from 24 to 48 hours, temporizing drainage procedures may be indicated.

FRIEDBERG, Chicago.

CONGENITAL ATRESIA OF OESOPHAGUS. R. H. R. BELSEY and C. P. DONNISON, Brit. M. J. **2**:324 (Aug. 5) 1950.

In 1947 Franklin, in *Lancet*, mentioned that congenital atresia of the esophagus occurred in 1 in 2,500 births. Belsey and Donnison, however, report that in their experience the incidence is much greater than that, being about 1 in 800 deliveries. They state that a number of cases are not diagnosed and that deaths which are due to this condition are attributed to other causes; it is their belief that this condition is even commoner than the above-mentioned figure.

The diagnosis is easy to make if the condition is suspected, and an early sign is the infant's bringing up large amounts of frothy mucus. It is pointed out that it is important that these children should not be fed by mouth until this condition has been excluded. The diagnosis is easily made by the passage of a rubber catheter into the stomach and can be confirmed by roentgenologic studies with a contrast medium.

These authors report 10 patients who were treated by operation; 5 patients survived. The transpleural approach was used in all five of the successfully treated patients. It is also stated by the authors that feeding by mouth can be resumed 24 hours after operation or earlier and that a gastrostomy appears to be unnecessary in the uncomplicated cases.

BIRDSONG, Charlottesville, Va. [A. M. A. Arch. Neurol. & Psychiat.].

TREATMENT OF PNEUMOCOCCUS MENINGITIS WITH MAXIMUM DOSES OF PENICILLIN. R. GOLDSTEIN, Ann. pædiat. **177**:55 (July) 1951.

The author recommends the treatment of patients with pneumococcal meningitis with large intramuscular doses of penicillin (8 to 12 times daily, 500,000 to 1,000,000 units, total dose of 4 to 10 million units). This treatment is superior to the combined therapy of penicillin given intrathecally and intramuscularly in smaller doses with sulfonamides given orally. With this method the duration of treatment is considerably shortened. Also, the irritation of the meninges by the injected penicillin is avoided, and development of scars and of encephalitic foci is less likely.

The control of the number of cells in the spinal fluid resumes again its absolute importance; with intrathecal therapy the number of cells was slightly increased owing to the injection, and these figures could thus not be used for prognostic purposes nor as an indication of when the treatment should be terminated.

Intramuscularly injected penicillin in large doses is therapeutically more reliable than intrathecally injected penicillin because irrespective of adhesions it will reach all the inflamed regions and reduce the risk of relapses.

FROM THE AUTHOR'S SUMMARY.

TRAUMATIC GRADENIGO SYNDROME DUE TO TRAUMA RESULTING FROM GUNSHOT WOUND TO CRANIUM. R. M. FILHO and P. B. MAGALHAES, Arq. neuro-psiquiat. **9**:79 (March) 1951.

A white man aged 21 was shot in the head, the bullet entering the external wall of the left orbit and lodging in the right temporal region. There was no loss of consciousness. The patient suffered severe injury to the left eyeball, which had to be nucleated. After the injury, he noted numbness of the right side of the face and difficulty in chewing on the right side. Neurokeratitis paralytica appeared on the right side six months after injury. Examination five months after the accident showed diminution of sensation of all three branches of the right trigeminal nerve, motor paralysis of the right trigeminal nerve, with deviation of the jaw to the right, and absence of the right corneal reflex. There was no impairment of vibratory sensation on the right side of the face when a C (128 d.v.) fork was used, but definite impairment was evidenced C′ (256 d.v.) with the fork. There were neurokeratitis paralytica and paralysis of the external rectus on the right side.

No fracture lines could be demonstrated. In the skull the shadow of a metallic substance was observed in the upper surface of the petrous process of the temporal bone. The bullet was

found in the right temporal region. The authors state that they have been unable to find a similar case in the literature.

SAVITSKY, New York [A. M. A. ARCH. NEUROL. & PYSCHIAT.].

TREATMENT OF PNEUMOCOCCAL MENINGITIS IN CHILDREN. J. HNATEK, Pediat. listy **5**:169 (No. 3) 1950.

Nine children with pneumococcal meningitis, seven of whom were admitted in a state of deep unconsciousness, were treated with intrathecal and systemic administration of penicillin and with large doses of sulfonamides. The mortality was 25%. All patients with primary meningitis recovered completely. The strikingly rapid response to penicillin if administered intrathecally during the first stage of the illness is pointed out. Attention is drawn to the frequency of a so-called second stage, a stage of abscess formation (Švejar), and to the response to thecal penicillin even in this second stage.

FROM THE AUTHOR'S SUMMARY [A. M. A. AM. J. DIS. CHILD.].

SPECIFIC TREATMENT OF HEMOPHILUS INFLUENZAE (PFEIFFER) MENINGITIS. KNUD BRÖCHNER-MORTENSEN, HANS C. ENGBAEK, and KOI SCHMITH, Ugesk. læger **110**:139 (Feb. 5) 1948.

With type-specific serum produced in Denmark, seven patients were treated; of these, two died (ages 7 and 9 months). The surviving children were 5 months, 1, 1½, 1½, and 5 years of age. Administration as soon as possible of 100,000 units of serum twice in 24 hours, intravenously or intraperitoneally, is recommended. If the bacteria persist in the spinal fluid several days, another 10,000 to 15,000 units should be given. In addition, sulfathiazole and streptomycin should be used.

WALLGREN, Stockholm, Sweden [A. M. A. AM. J. DIS. CHILD.].

HEMOPHILUS INFLUENZAE MENINGITIS TREATED WITH STREPTOMYCIN, SULFONAMIDE, AND TYPE-SPECIFIC RABBIT IMMUNE SERUM. HANS C. ENGBAEK, Ugesk. læger **110**:1355 (Nov. 25) 1948.

Of seven children (ages 4, 7, 11, 13, 14, 24, and 31 months) treated alike with streptomycin, sulfonamide, and type-specific rabbit immune serum, only one died (4 months). All children with Hemophilus influenzae meningitis should be treated with type-specific rabbit immune serum and sulfonamide. In children under 2 years of age streptomycin should also be given, from the start of treatment on; in children above this age streptomycin is recommended only if the effect of serum and sulfonamide within the first 48 hours is not satisfactory.

WALLGREN, Stockholm, Sweden [A. M. A. AM. J. DIS. CHILD.].

Directory of Otolaryngological Societies *

INTERNATIONAL

PAN AMERICAN ASSOCIATION OF OTO-RHINO-LARYNGOLOGY AND BRONCHO-ESOPHAGOLOGY

Meeting: Third Pan-American Congress of Oto-Rhino-Laryngology and Broncho-Esophagology
Place: Habana, Cuba. Time: January 20-24, 1952.
President: Dr. José Gros.
Secretary: Dr. Pedro Hernandez Gonzalo, Calle 8, 358 Habana, Cuba.

THIRD LATIN AMERICAN CONGRESS OF OTORHINOLARYNGOLOGY AND BRONCHOESOPHAGOLOGY

Place: Caracas, Venezuela. Time: 1953.

FIFTH INTERNATIONAL CONGRESS OF OTO-RHINO-LARYNGOLOGY

Place: Amsterdam, Netherlands. Time: June 8-15, 1953.
President: Prof. Ellco Huizingo.
General Secretary: W. H. Struben, J. J. Viottastraat 1, Amsterdam-Z.
Scientific Secretaries: J. Bijtel and P. G. Gerlings.

NATIONAL

AMERICAN MEDICAL ASSOCIATION, SCIENTIFIC ASSEMBLY, SECTION ON LARYNGOLOGY, OTOLOGY AND RHINOLOGY

Chairman: Dr. Carl H. McCaskey, 20 N. Meridian St., Indianapolis.
Secretary: Dr. Sam H. Sanders, 1089 Madison Ave., Memphis 3.
Place: Chicago. Time: June 11-13, 1952.

AMERICAN ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

President: Dr. Derrick Vail, 700 N. Michigan Avenue, Chicago 11.
Executive Secretary-Treasurer: Dr. William L. Benedict, 100-1st Ave. Bldg., Rochester, Minn.
Place: Palmer House, Chicago. Time: Oct. 14-20, 1951.

AMERICAN BOARD OF OTOLARYNGOLOGY

Secretary: Dr. Dean M. Lierle, University Hospitals, Iowa City.
Place: Palmer House, Chicago. Time: Oct. 6-10, 1952.
Place: Royal York Hotel, Toronto, Canada. Time: May 13-17, 1952.

AMERICAN BRONCHO-ESOPHAGOLOGICAL ASSOCIATION

President: Dr. Herman J. Moersch, Mayo Clinic, Rochester, Minn.
Secretary: Dr. Edwin N. Broyles, 1100 N. Charles St., Baltimore 1.
Place: Royal York Hotel, Toronto, Canada. Time: May 20-22, 1952.

AMERICAN LARYNGOLOGICAL ASSOCIATION

President: Dr. H. Marshall Taylor, 111 W. Adams St., Jacksonville, Fla.
Secretary: Dr. Louis H. Clerf, 128 S. 10th St., Philadelphia 2.
Place: Royal York Hotel, Toronto, Canada. Time: May 23-24, 1952.

AMERICAN LARYNGOLOGICAL, RHINOLOGICAL AND OTOLOGICAL SOCIETY, INC.

President: Dr. C. Stewart Nash, 708 Medical Arts Bldg., Rochester 7, N. Y.
Secretary: Dr. C. Stewart Nash, 708 Medical Arts Bldg., Rochester 7, N. Y.
Place: Royal York Hotel, Toronto, Canada. Time: May 20-22, 1952.

SECTIONS:

Eastern.—Chairman: Dr. Francis W. Davison, Geisinger Memorial Hospital, Danville, Pa.
Place: Waldorf-Astoria, New York. Time: Jan. 11, 1952.
Southern.—Chairman: Dr. Lester A. Brown, 490 Peachtree St., Atlanta.
Place: Academy of Medicine, Atlanta. Time: Jan. 14, 1952.
Middle.—Chairman: Dr. Ralph J. McQuiston, 20 N. Meridian St., Indianapolis.
Place: Indianapolis Athletic Club, Indianapolis. Time: Jan. 28, 1952.
Western.—Chairman: Dr. Howard P. House, 1136 W. 6th St., Los Angeles.
Place: County Medical Building, Los Angeles. Time: Jan. 19-20, 1952.

AMERICAN OTOLOGICAL SOCIETY

President: Dr. Gordon D. Hoople, 1100 E. Genesee St., Syracuse, N. Y.
Secretary: Dr. John R. Lindsay, 950 E. 59th St., Chicago.
Place: Royal York Hotel, Toronto, Canada. Time: May 18-19, 1952.

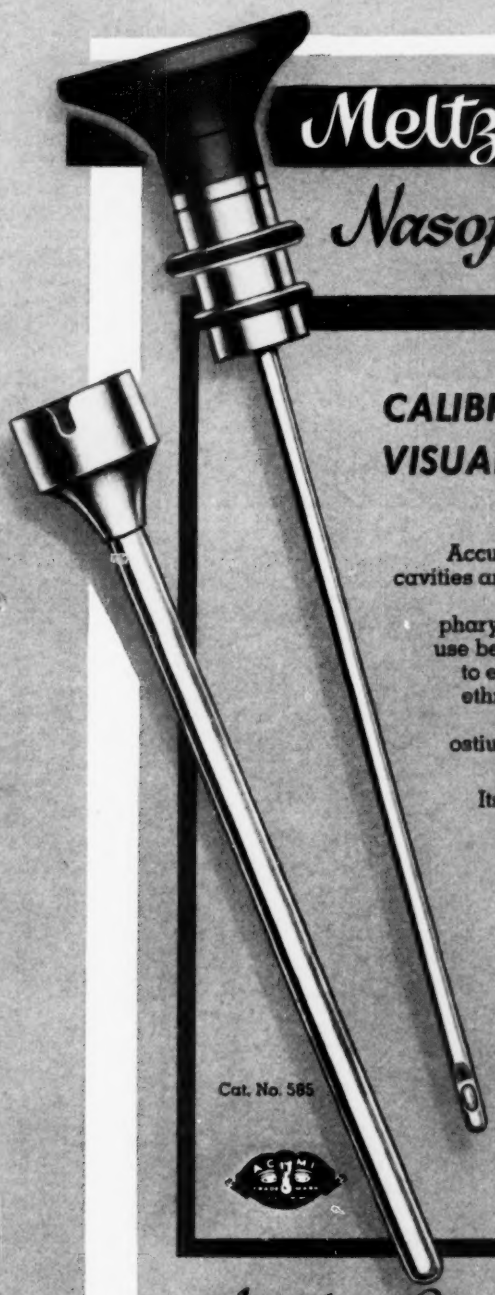
AMERICAN OTORHINOLOGIC SOCIETY FOR THE ADVANCEMENT OF PLASTIC AND RECONSTRUCTIVE SURGERY, INC.

President: Dr. Benjamin H. Shuster, 1824 Pine St., Philadelphia.
Secretary: Dr. Joseph G. Gilbert, 111 E. 61st St., New York 21.

AMERICAN SOCIETY OF OPHTHALMOLOGIC AND OTOLARYNGOLOGIC ALLERGY

President: Dr. William H. Evans, 24 Wick Ave., Youngstown 3, Ohio.
Secretary-Treasurer: Dr. Joseph Hampsey, 806 May Bldg., Pittsburgh 22.

* Secretaries of societies are requested to furnish the information necessary to keep this list up to date.



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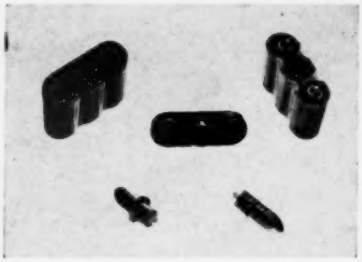

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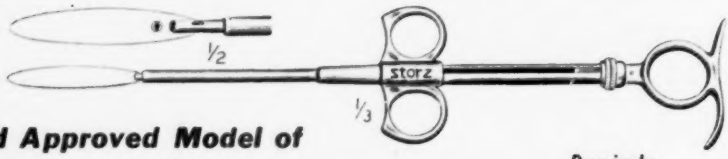

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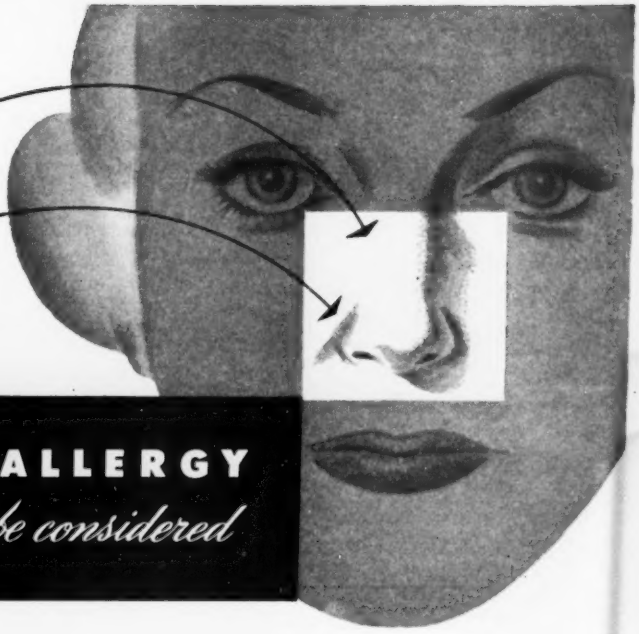

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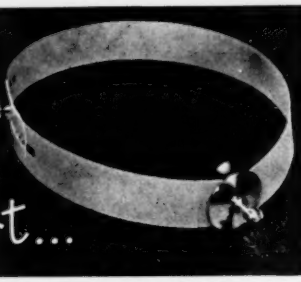

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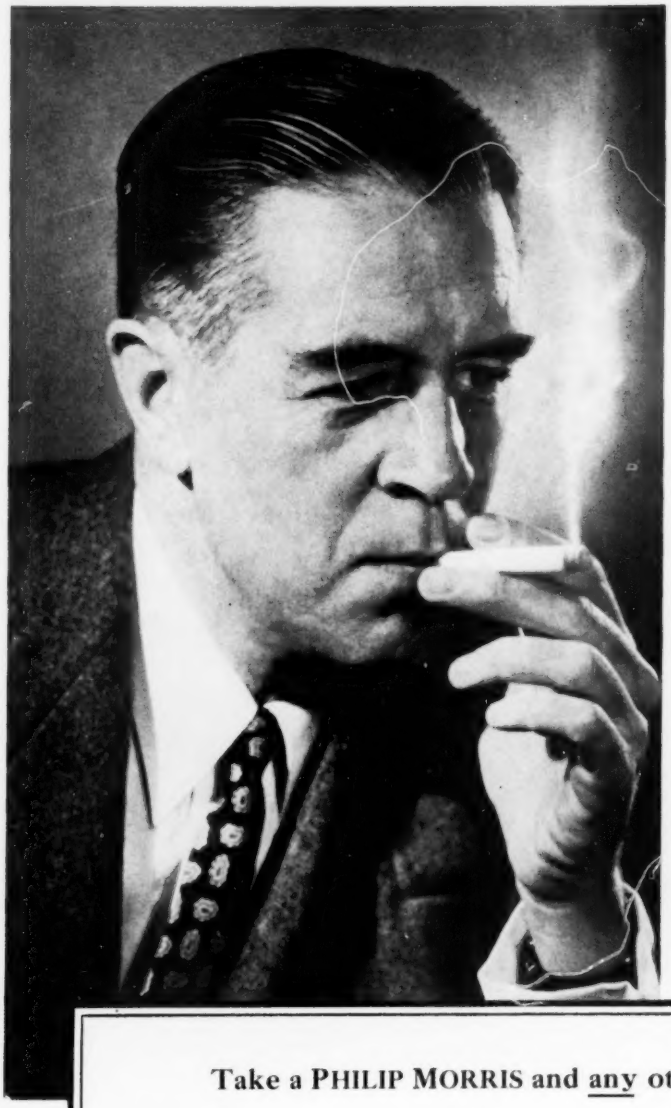

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1. Tuft, L.: Clinical Allergy. Philadelphia, W. B. Saunders Co., 1947, pp. 335-336.
2. Hansel, F. K.: Allergy of the Nose and Paranasal Sinuses. St. Louis, C. V. Mosby Co., 1936, p. 769.
3. Kelley, S. F.: Choice of Sympathomimetic Amines. Cornell Conferences on Therapy, II, 1947, p. 156.

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